DURIRON ACID-PROOF BUILDING EQUIPMENT

DRAINAGE VENTILATION

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PRODUCED ONLY BY
The DURIRON COMPANY, INC.
DAYTON, OHIO.

DURIRON

Acid-Proof Building Equipment

a Handbook for

The Architect and Engineer

24-264

INDEX

FOREWORD

THIS handbook has been prepared for the Architect and Engineer as an aid in writing specifications for Duriron building equipment, and it contains working drawings of pipe, fittings, exhaust fans, and allied material.

The section devoted to exhaust fans (pages 16-19) contains tables and information relative to speeds, pressures and capacities of this apparatus.

Duriron building equipment is of the class of material that does not lend itself particularly to illustration, except by resorting to the common expedient of showing structures where it is in service.

We therefore show on pages 6 and 7 groups of buildings where Duriron is installed, and these are carried as types of structure where Duriron serves better than any other material.

However, it is obviously impossible to cover the extensive field of industrial and manufacturing users.

Whenever it is desirable to have technical and chemical data beyond that carried in this book, it will be supplied from our very complete files on corrosion.

These records are not limited to Duriron, but include all materials that may be considered for the handling of acids.

In addition to this co-operation, our Engineering Department is constantly engaged in the design of Duriron equipment for special uses arising in the course of building design, and this service is without obligation.

It is the fixed policy of this Company to advise the use of Duriron only when convinced that the application is right, and its use is a betterment as well as an eventual economy.

Dayton, Ohio
May, 1924

THE DURIRON COMPANY, Inc.,
Building Equipment Department.

INTRODUCTION

The extensive field for Duriron as structural equipment first was appreciated in its application for drain pipe.

The drain line for carrying acids, alkalis, and water contaminated with them, was a problem of plumbing specifications.

Duriron, universally acid-proof, and possessing every characteristic necessary, has proved to be the one perfect material for this purpose.

The limitations of the various materials previously used are briefly summarized:

CAST IRON is immediately attacked and eventually destroyed by many commonly used acids.

WROUGHT IRON and STEEL are generally less resistant to acid attack than cast iron.

BRASS will not withstand the attack of such widely used corrosives as nitric, strong sulphuric and muriatic acids, and iron chloride.

COPPER is affected similarly to brass.

LEAD is quickly attacked by nitric, strong sulphuric, muriatic, iron chloride, and other generally used acids. It is structurally weak, and is likely to develop pinholes and blisters, causing leaks. Used as a lining for steel or iron pipe, lead is open to all the above criticism except weakness.

TILE is rapidly disintegrated by most acids as soon as its glaze is destroyed, though resistant previous to this. The chief objection to tile pipe is the difficulty of maintaining tight joints.

GLASS LINED or ENAMEL LINED pipe is resistant to most acids, but the lining is easily chipped or cracked, thus destroying its value.

FIBER pipe warps from temperature variations, becomes softened by liquids, sags and leaks.

DURIRON pipe is free from all of the above objections. Being a solid cast metal it has no vulnerable surface or section. It is amply strong, and is installed the same and as easily as cast iron soil pipe.

The Metal—Duriron

Duriron is a cast alloy of iron completely resistant to the action of commercial corrosives. Being a homogeneous metal, it requires no protective coating, and it is equally immune from attack inside, outside, and all through its structure.

Chemical Analysis of Duriron

The chemical analysis of Duriron is approximately as follows:

Silicon	above 14.25%
Carbon	below 0.80%
Manganese	below 0.50%
Sulphur	below 0.08%
Phosphorus	below 0.20%

Physical Properties of Duriron

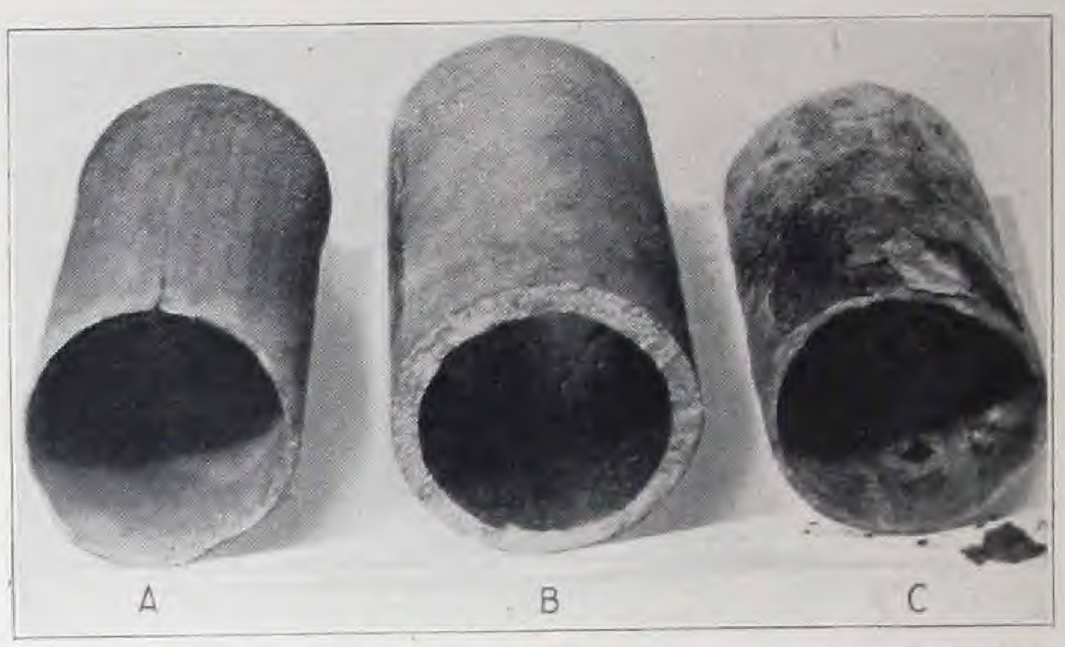
The Testing Laboratories of the School of Engineering of Columbia University a few years ago made exhaustive chemical and physical tests on Vitrified Tile, Lead and Duriron pipe. A condensed summary of their physical tests follows:

Physical Tests	Vitrified Tile Pipe	Lead Pipe	Duriron Pipe
Average ultimate crushing load in pounds per foot.	1556	1492	13,490
Average transverse ultimate load in pounds, center load, span 21"	1813	400	11,250
Modulus of rupture computed from crushing load (lbs. per sq. in.)	1644	*	17,200

*Impossible to compute the modulus of rupture for a plastic material such as lead.

How Acids Destroy Pipe

I



A—Cast iron pipe after 160 hours in nitric acid, 10% strength.

B—Duriron pipe after 360 hours in nitric acid and 360 hours in sulphuric acid, both 10% strength.

C—Cast iron pipe after 240 hours in sulphuric acid, 10% strength.

A, B and C were the same length and wall thickness before being submerged in acid.

II

The photograph above shows sections of extra heavy lead, Duriron and brass pipe, all two-inch size.

This picture shows the same sections after the lead and brass were each submerged in nitric acid, 25% strength, for 72 hours. The Duriron section was submerged for 336 hours in the same acid.

While these tests on Duriron are of too short duration to prove its entire resistance to acids, they do show the rapid failure of cast iron, lead and brass to two of the most generally used corrosives.

Installation of Duriron Pipe

Duriron bell and spigot pipe is cut and installed in the same manner as cast iron soil pipe, the labor being the same.

In making the joints, asbestos rope (85% pure) should be used in place of the usual oakum, after which molten lead is poured and caulked in the ordinary manner.

We make and furnish a specially treated asbestos rope packing which assures a permanent joint.

Hangers should be provided at each bend and at each length of pipe in horizontal lines. Vertical lines should be supported at intervals not greater than ten feet.

Cost of Duriron Pipe

Past records indicate that the cost of a Duriron pipe installation is about the same as that of a lead-lined job of equal size.

As compared to extra heavy cast iron soil pipe, the cost of a completed Duriron installation, including labor, is about three times as great.

This additional cost, however, is a small fraction of one per cent of the cost of the structure, and results in permanent freedom from repairs or replacements due to corrosion.

After one replacement of a cast iron drain line the costs are about equal, and this must be followed by similar renewals from time to time.

Some Advantages of Duriron Pipe

Requires no protective coating inside or outside.

Easily installed, and familiar work to all plumbers.

Unnecessary to encase in concrete, provide drip pans, or otherwise to prepare for the failure that is certain with other pipe.

Elaborate supports not needed.

Lines may be run in walls and ceiling if desired.

Joints remain tight as cast iron soil pipe joints.

Fills code requirements for sanitary house drains.

Does not warp nor sag from heat.

No discoloration of wall when run in partitions.

Takes paint readily when desired for decorative purposes.

Complete stocks always maintained, permitting immediate delivery.

Permits location of department such as laboratory anywhere in structure.

Duriron Should Be Specified

For waste lines from educational, hospital and industrial laboratories.

In loft buildings and those devoted to crafts and professions using acid.

Waste lines from industrial plants whose processes require corrosive use.

House drains for combination acid and sanitary wastes.

For all wastes through cinder concrete, cinder fills, or other situations where corrosion occurs on **outside** of pipe.

Fans and ducts for removal of corrosive fumes from chemical hoods, laboratories, pickling rooms, etc.

Roof vents exposed to extreme atmospheric corrosion.

All wastes where absolute insurance is desired against leaks due to corrosion or rust.

Typical Duriron Specifications

PIPE—All pipe and fittings carrying acid wastes from .....to..... shall be of a cast metal known to the trade as Duriron, as manufactured by The Duriron Company, Inc., Dayton, Ohio; or of a ferro-silicon alloy of the following analysis:

Silicon	above 14.25%
Carbon	below 0.80%
Manganese	below 0.50%
Sulphur	below 0.08%
Phosphorus	below 0.20%

All such pipe and fittings with hub and spigot ends of the same pattern, thickness, etc., as extra heavy cast iron pipe, and of the sizes shown on drawings.....

JOINTS—All joints shall be caulked joints made with pure asbestos rope and molten lead, thoroughly caulked, finishing flush up with the face of hubs.

ALIGNMENT—All pipe lines shall be correctly aligned before joints are made. Proper supports shall be provided; at least one support to each length of pipe in horizontal lines; one at each bend; and supports at intervals no greater than ten feet in vertical lines.

CLEANOUTS—Suitable cleanout plugs of the same metal as the pipe shall be provided at points shown on drawings.

FLOOR DRAINS—Floor drains in.....shall be of the same metal as specified for pipe above.

NOTE: Josam-Duriron double drainage drains are best for this purpose. They prevent seepage around the drain.

LOCATION OF FLOOR OUTLETS—See paragraph at bottom of page 8.

VENTS—Vents carrying acid fumes shall be of the same metal as specified for pipe above. Joints shall be made in the same manner as pipe.

SINKS—All sinks, including waste connections, outlets, standing overflows and traps, shall be of the same metal as specified for pipe above. Each sink shall have the name of the metal cast thereon in raised letters.

NOTE: If it is desired to use sinks of other material, the outlets, standing overflows, traps, etc., should be of Duriron.

EXHAUST FANS—All exhaust fans for exhausting corrosive fumes from....., and from all laboratory hoods shall be of the same metal as specified for pipe. Such fans shall be of the size, type and capacity, and shall be operated at the speeds shown in the following schedule.

NOTE: For detailed specifications for fans, with table showing capacities, pressures and power requirements, see pages 17 and 18.

Duriron Equipped Buildings

Chemical Laboratories, College of Engineering
Carnegie Institute of Technology
Pittsburgh

The original drain lines in this laboratory were lead and terra cotta. The lead lines were eaten away, and it was impossible to keep tight joints in the terra cotta lines. Now, with Duriron lines, repairs and trouble are eliminated.

Butler Brothers Annex, Chicago
Graham, Anderson, Probst & White
Architects

The Duriron line carrying acid wastes from the electrotyping department of Butler Brothers' Annex has been in service since 1920. This department is on the top floor, and they have been entirely free from leakage which might cause enormous damage to the merchandise stocks on the floors below. With Duriron lines installed, there is no question raised over the location of a department where acids are used.

United States Mint
Philadelphia.

The "hardening room" of the Philadelphia Mint is where silver blanks are heat treated and acid cleaned. Iron, brass, lead and hard rubber pipe were tried in turn, and all failed. Now, with Duriron pipe, the difficulty is ended.

Many U. S. Government and State buildings are Duriron equipped.

Jewellers' Exchange Building
Los Angeles
G. Albert Lansburgh, Architect

Acid wastes from the manufacturers' sinks in this building are carried in Duriron pipe. Nitric acid, which quickly destroys other materials, has no effect on Duriron.

John Herbert Phillip High School,
Birmingham, Alabama
D.O. Whilldin, Architect

This high school is one of hundreds of educational structures whose Duriron laboratory drain lines insure them from leakage for all time.

Duriron Equipped Buildings

Fifth Avenue Hospital, New York
York and Sawyer, Architects

The Fifth Avenue Hospital is the only wardless hospital in the world. Every patient has his room, although half of these are free. All of the equipment is the best, and the drain lines from the laboratories are, of course, Duriron.

The importance of perfect sanitation in the hospital has resulted in widespread specification of Duriron pipe.

Transformer & Battery Station
The New York Edison Company, New York
W. Whitehill, Architect

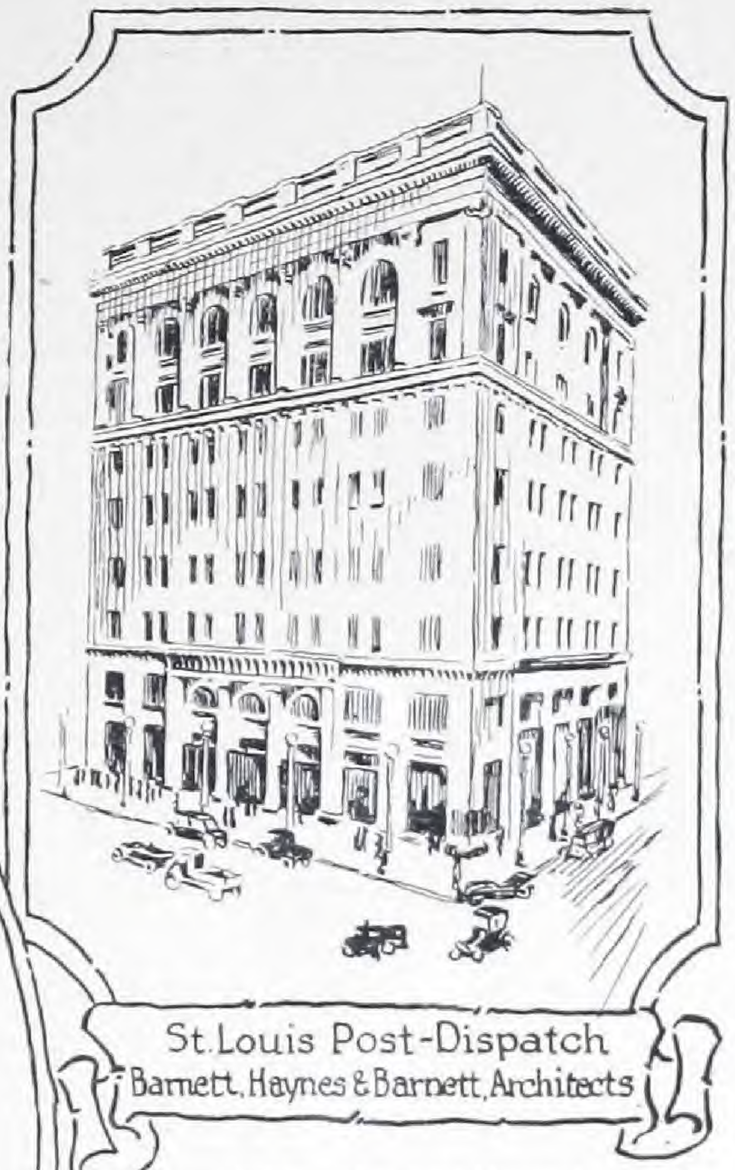
The New York Edison Company has standardized on Duriron drain pipe, floor drains, etc., in all of its acid handling departments.

Charging and battery stations are insured of a permanent installation with Duriron.

S.W. Straus & Company
Building ~ Chicago
Graham, Anderson, Probst & White, Architects

This great structure —a monument to the Straus Company — is equipped with Duriron drain lines that handle the acid waste from the battery room of the private telephone exchange.

Where permanence is especially desired, as in public buildings, memorials, etc., the certainty of Duriron's endurance makes it the most fitting specification.



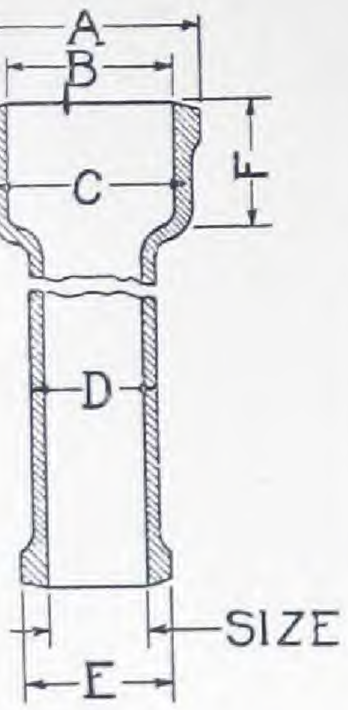
St. Louis Post-Dispatch
Barnett, Haynes & Barnett, Architects

When The Post-Dispatch building was planned in 1916, no effort was spared to make it the model news plant of the world. This was the first newspaper to install Duriron lines from the photo engraving department. Since then hundreds of news and engraving plants have become Duriron equipped.

Fitzhugh Building, San Francisco
Geo. W. Kelham, Architect

Carefully planned for the medical and dental professions, the Fitzhugh Building installed Duriron drain lines to carry the wastes from operating rooms and laboratories.

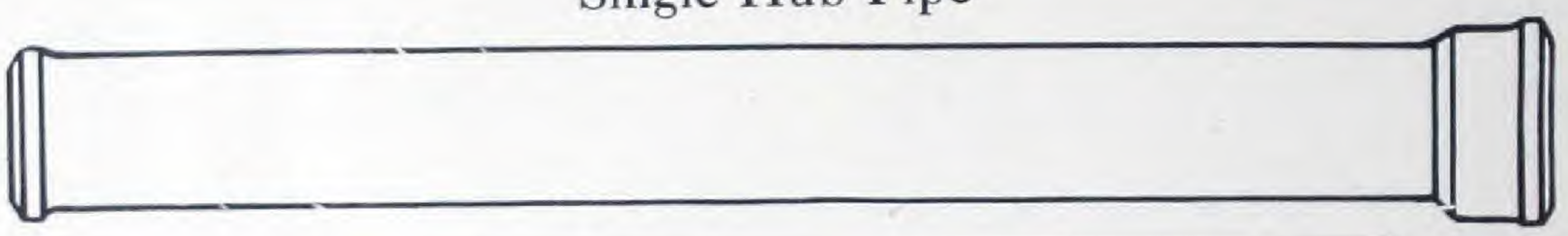
PART I—DRAINAGE



Pipe and Fittings Dimension Table

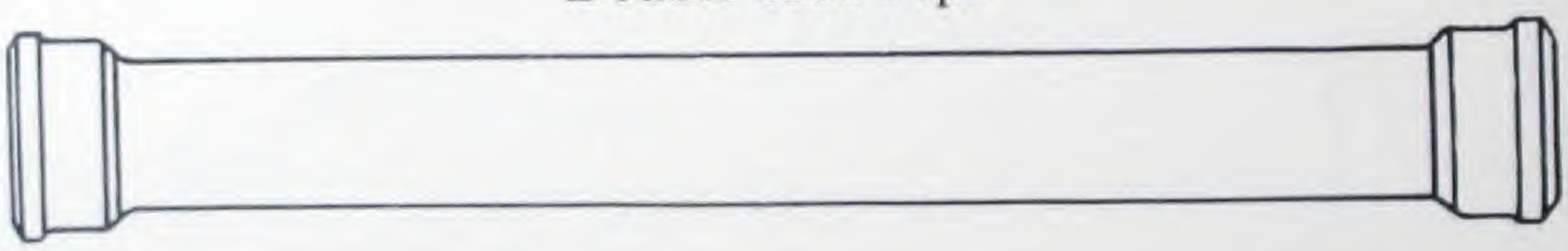
Size	1½"	2"	3"	4"	6"	8"	10"	12"	15"
A	3 13/16"	4 5/16"	5 5/16"	6 5/16"	8½"	11¼"	14¼"	16¾"	20"
B	2 13/16"	3 5/16"	4 5/16"	5 5/16"	7 5/16"	9⅝"	12¼"	14½"	17¾"
C	3 7/16"	3 15/16"	4 15/16"	5 15/16"	7 15/16"	10¾"	13¾"	16"	19½"
D	2⅛"	2⅝"	3⅝"	4⅝"	6¾"	9"	11¼"	13¼"	16½"
E	2⅜"	2⅞"	3⅞"	4⅞"	7⅛"	9¼"	11⅝"	14"	17"
F	2⅜"	2½"	2¾"	3"	3"	3⅜"	3⅝"	3⅞"	4⅛"

Single Hub Pipe



Size	Length	Over All Length	Weight
1½"	3'	3'-2⅜"	18 lbs.
2"	4'	4'-2½"	32 lbs.
3"	5'	5'-2¾"	59 lbs.
4"	5'	5'-3"	79 lbs.
6"	5'	5'-3"	135 lbs.
8"	5'	5'-3⅜"	230 lbs.
10"	5'	5'-3⅝"	380 lbs.
12"	5'	5'-3⅞"	458 lbs.
15"	5'	5'-4⅛"	680 lbs.

Double Hub Pipe

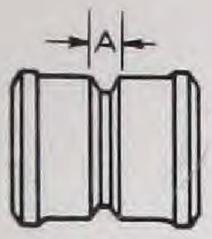


Size	Length	Over All Length	Weight
1½"	3'	3'-4¾"	21 lbs.
2"	4'	4'-5"	34 lbs.
3"	4'	4'-5½"	50 lbs.
4"	5'	5'-6"	81 lbs.
6"	5'	5'-6"	142 lbs.
8"	5'	5'-6¾"	253 lbs.
10"	5'	5'-7¼"	409 lbs.
12"	5'	5'-7¾"	497 lbs.
15"	5'	5'-8¼"	740 lbs.

IMPORTANT IN LABORATORY SPECIFICATIONS

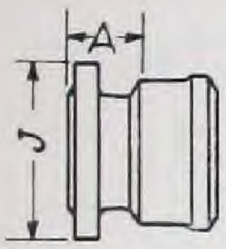
Exact location of floor outlets in accordance with specifications should be insisted upon. If this is not done within close limits, the laboratory furniture contractor cannot properly locate his equipment.

Improper location of openings by the plumbing contractor may give an excuse to the furniture contractor to try to substitute a cheaper material, to offset the extra fitting work.



DOUBLE HUBS

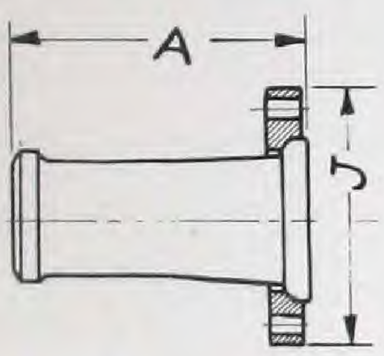
Size	1½"	2"	3"	4"	6"	8"	10"	12"	15"
Weight, Lbs.	5½	6½	9	15	24	44	75	102	148
Dimension A	1"	1"	1"	1"	1"	2"	2"	2"	2"



ADAPTER—BELL AND FLANGE

Size	1½"	2"	3"	4"	6"
Weight, Lbs.	7	9½	14½	21	30
Dimension A	2⅛"	2½"	2½"	2¾"	3"
Dimension J	5"	6"	7½"	9"	11"

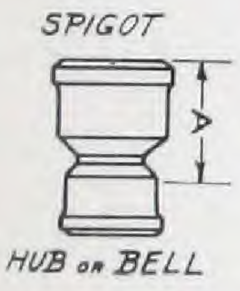
Note: Bolt dimensions U. S. 1912 Standard.



ADAPTER—SPIGOT AND SPLIT FLANGE

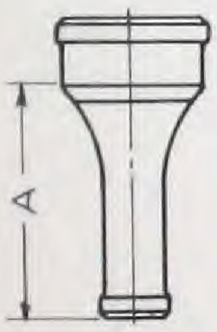
Size	1½"	2"	3"	4"	6"
Weight, Lbs.	6	9	16	24	32
Dimension A	5¼"	5¾"	7"	8"	9½"
Dimension J	5"	6"	7½"	9"	11"

Note: These include Split Flanges. Standard Bolt Dimensions. Larger sizes on request.



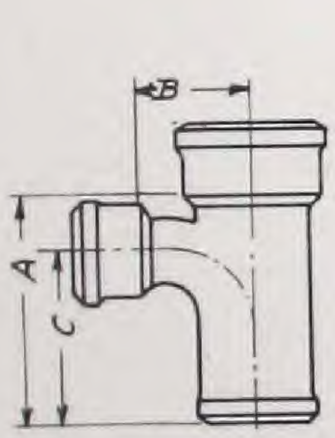
SANITARY REDUCERS

Size	Weight	A	Size	Weight	A
2"x1½"	5	5"	8"x6"	29	6"
3"x1½"	6	5"	10"x4"	42	6"
3"x2"	7	5"	10"x6"	48	6"
4"x1½"	7	5"	10"x8"	54	6"
4"x2"	8	5"	12"x6"	56	6"
4"x3"	9	5"	12"x8"	63	6"
5"x4"	12	5"	12"x10"	74	6"
6"x2"	12	5"	15"x6"	79	6"
6"x3"	13	5"	15"x8"	88	6"
6"x4"	14	5"	15"x10"	103	6"
6"x5"	18	5"	15"x12"	109	6"
8"x4"	27	6"			



SANITARY INCREASERS

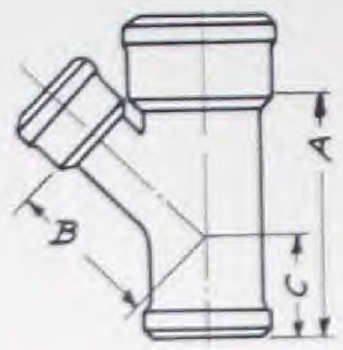
Size	Weight	A	Size	Weight	A
1½"x2"	7	9"	4"x8"	43	11⅝"
1½"x3"	8½	9"	5"x6"	18	9"
1½"x4"	10½	9"	6"x8"	50	11⅞"
2"x3"	9	9"	6"x10"	70	11⅞"
2"x4"	11	9"	8"x10"	82	11⅞"
2"x6"	15	9"	8"x12"	100	11⅝"
3"x4"	13	9"	10"x12"	115	11⅝"
3"x6"	16	9"	10"x15"	134	11⅞"
4"x5"	16	9"	12"x15"	160	11⅞"
4"x6"	17½	9"			



SANITARY T BRANCH

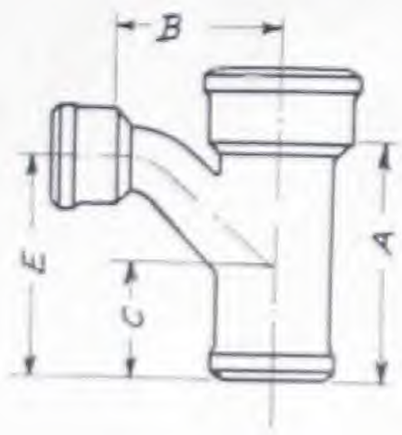
Size	Wt.	A	B	C	Size	Wt.	A	B	C
1½"x1½"	9	8⅜"	3¼"	6¾"	8"x 4"	65	10⅝"	6¼"	8"
2"x1½"	10	8½"	3½"	6¾"	8"x 6"	72	14½"	6⅝"	10½"
2"x2"	11	9"	3½"	7"	8"x 8"	87	19"	6⅝"	13½"
3"x1½"	13	8½"	4"	6¾"	10"x 6"	117	14½"	7⅝"	10½"
3"x2"	14	9"	4"	7"	10"x 8"	140	19"	7⅞"	13½"
3"x3"	17	10"	4"	7½"	10"x10"	166	21"	7¾"	14½"
4"x1½"	16	8½"	4"	6¾"	12"x 8"	168	19"	8¾"	13½"
4"x2"	18	9"	4½"	7"	12"x10"	206	21"	8¾"	14½"
4"x3"	21	10"	3½"	7½"	12"x12"	217	23"	8¾"	16"
4"x4"	22	11"	3½"	8"	15"x 8"	241	19"	10¼"	14"
6"x2"	35	9"	5½"	7"	15"x10"	275	21½"	10¼"	15"
6"x3"	39	10"	5½"	7½"	15"x12"	306	23½"	10¼"	16"
6"x4"	44	11"	5½"	8"	15"x15"	390	28"	10¼"	14¼"
6"x6"	52	13"	5½"	9"					

For detail of Hub and Spigot see page 8



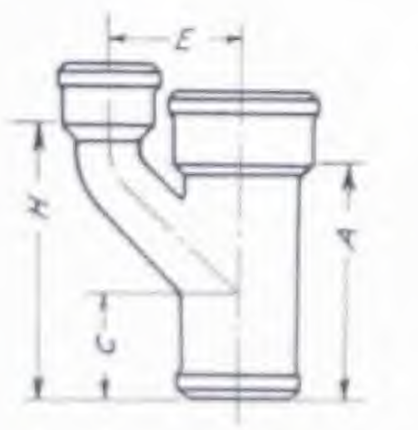
SANITARY Y BRANCH

Size	Wt.	A	B	C	Size	Wt.	A	B	C
1½"x1½"	9	8⅛"	3¾"	4⅜"	8"x 4"	71	13½"	10"	4½"
2"x1½"	10	8⅝"	4⅜"	4⅜"	8"x 6"	87	16½"	11"	6 1/16"
2"x2"	11	9"	4¼"	4¾"	8"x 8"	105	19½"	12¼"	7¼"
3"x1½"	13	8⅝"	5"	3⅞"	10"x 6"	145	16½"	12½"	5 1/16"
3"x2"	14	9"	5"	4¼"	10"x 8"	168	19½"	14"	6⅛"
3"x3"	17	10½"	5½"	5"	10"x10"	198	22½"	15"	7⅝"
4"x1½"	17	9⅛"	5¾"	3⅞"	12"x 8"	200	19½"	15½"	5"
4"x2"	18	9"	5¾"	3¾"	12"x10"	263	22½"	16½"	6⅝"
4"x3"	21	10½"	6¼"	4½"	12"x12"	292	25½"	17½"	8⅛"
4"x4"	25	12"	6¾"	5¼"	15"x 8"	286	19½"	17⅜"	3⅞"
6"x2"	35	9"	7⅛"	2¾"	15"x10"	345	22½"	18⅜"	5½"
6"x3"	39	10½"	7⅝"	3½"	15"x12"	405	25½"	19⅝"	7"
6"x4"	44	12"	8⅛"	4¼"	15"x15"	490	30"	21"	9⅛"
6"x6"	52	15"	9¼"	5¾"					



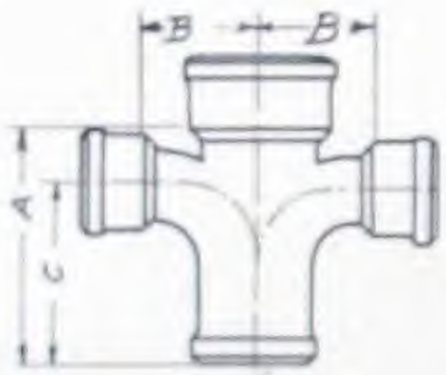
SANITARY T-Y OR COMBINATION Y AND ⅛ BEND

Size	Wt.	A	B	C	E	Size	Wt.	A	B	C	E
1½"x1½"	9	8⅛"	4⅝"	4⅜"	7⅜"	4"x2"	19	9"	6¼"	3 11/16"	8⅛"
2"x1½"	11	8¾"	4⅝"	4⅜"	7⅜"	4"x3"	22	10½"	7"	4½"	9⅛"
2"x2"	12	9"	5¼"	4¾"	8¼"	4"x4"	28	12"	7¾"	5¼"	10⅛"
3"x1½"	14	8⅝"	5⅛"	3⅞"	7⅜"	6"x2"	26	9"	7¼"	2 11/16"	8⅛"
3"x2"	15	9"	5¾"	4 1/16"	8 1/16"	6"x3"	34	10½"	8"	3½"	9⅛"
3"x3"	19	10½"	6½"	5"	9 1/16"	6"x4"	36	12"	8¾"	4¼"	10⅛"
4"x1½"	18	9⅛"	5⅞"	3⅞"	8⅛"	6"x6"	47	15"	10¼"	5¾"	13⅛"



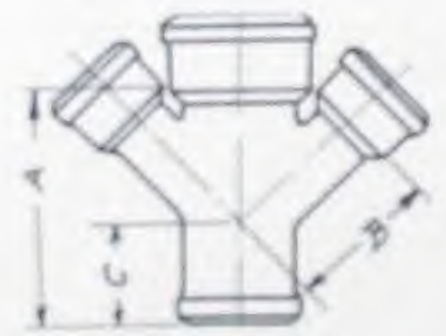
SANITARY UPRIGHT Y BRANCH OR H FITTING

Size	Wt.	A	C	E	H	Size	Wt.	A	C	E	H
1½"x1½"	9	8⅛"	4⅜"	4"	10"	4"x2"	19	9"	3 1/16"	5½"	11"
2"x1½"	11	8¾"	4⅜"	4¼"	10¼"	4"x3"	22	10½"	4½"	6"	12⅛"
2"x2"	12	9"	4¾"	4½"	11"	4"x4"	28	12"	5¼"	6½"	14"
3"x1½"	14	8⅝"	3⅞"	4¾"	10¼"	6"x2"	36	9"	2 11/16"	6½"	11"
3"x2"	15	9"	4 1/16"	5"	11"	6"x3"	41	10½"	3½"	7"	12⅛"
3"x3"	19	10½"	5"	5½"	12½"	6"x4"	46	12"	4¼"	7½"	14"
4"x1½"	18	9⅛"	3⅜"	5¼"	10¾"	6"x6"	56	15"	5¾"	8½"	16⅛"



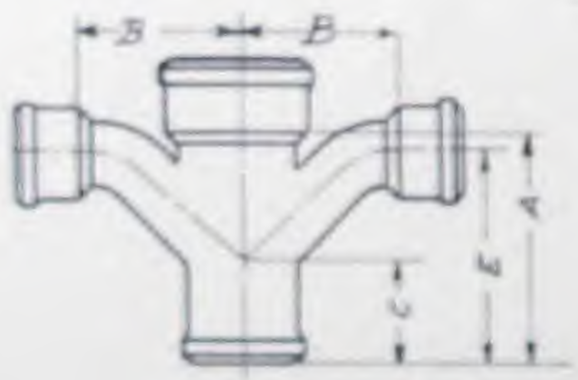
DOUBLE BRANCH SANITARY T

Size	Wt.	A	B+B	C	Size	Wt.	A	B+B	C
1½"x1½"	11	8⅜"	6½"	6¾"	4"x 2"	20	9"	9"	7"
2"x1½"	12	8½"	7"	6¾"	4"x 3"	26	10"	7"	7½"
2"x2"	14	9"	7"	7"	4"x 4"	33	11"	7"	8"
3"x1½"	13	8½"	8"	6¾"	6"x 2"	42	9"	11"	7"
3"x2"	20	9"	8"	7"	6"x 3"	50	10"	11"	7½"
3"x3"	21	10"	8"	7½"	6"x 4"	54	11"	11"	8"
4"x1½"	19	8½"	8"	6¾"	6"x 6"	65	13"	11"	9"



DOUBLE BRANCH SANITARY Y

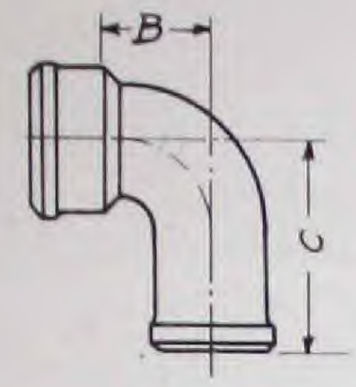
Size	Wt.	A	B	C	Size	Wt.	A	B	C
1½"x1½"	11	8⅝"	3¼"	4⅜"	4"x 2"	21	9"	5¼"	3 11/16"
2"x1½"	13	8⅝"	4⅛"	4⅜"	4"x 3"	27	10½"	6¼"	4½"
2"x2"	15	9"	4¼"	4¾"	4"x 4"	33	12"	6¾"	5⅛"
3"x1½"	14	8⅝"	5"	3⅞"	6"x 2"	42	9"	7⅛"	2 11/16"
3"x2"	14	9"	5"	4 1/16"	6"x 3"	51	10½"	7⅝"	3½"
3"x3"	21	10½"	5½"	5"	6"x 4"	55	12"	8⅛"	4⅛"
4"x1½"	20	9⅛"	5⅜"	3⅞"	6"x 6"	66	15"	9¼"	5⅛"



DOUBLE BRANCH SANITARY T-Y

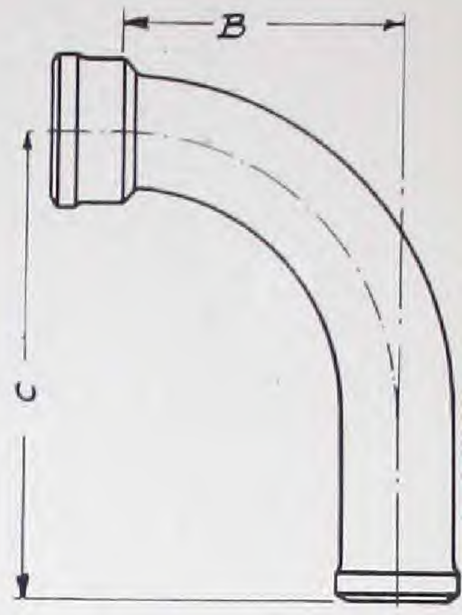
Size	Wt.	A	B+B	C	E	Size	Wt.	A	B+B	C	E
1½"x1½"	14	8⅝"	9¼"	4⅜"	7⅜"	4"x2"	26	9"	12½"	3 11/16"	8⅛"
2"x1½"	15	8¾"	9¼"	4⅜"	7⅜"	4"x3"	30	10½"	14"	4½"	9⅛"
2"x2"	18	9"	10½"	4¾"	8¼"	4"x4"	45	12"	15½"	5¼"	10⅛"
3"x1½"	21	8⅝"	10¼"	3⅞"	7⅜"	6"x2"	44	9"	14½"	2 11/16"	8⅛"
3"x2"	22	9"	11½"	4 1/16"	8 1/16"	6"x3"	53	10½"	16"	3½"	9⅛"
3"x3"	29	10½"	13"	5"	9 1/16"	6"x4"	57	12"	17½"	4⅛"	10⅛"
4"x1½"	24	9⅛"	11¾"	3⅞"	8⅛"	6"x6"	71	15"	20½"	5¾"	13⅛"

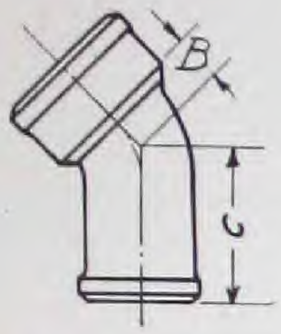
For detail of Hub and Spigot see page 8



QUARTER BENDS

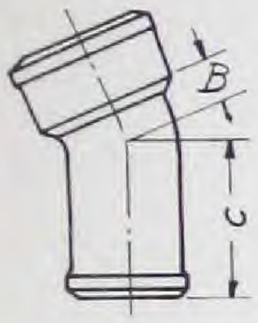
Size	1½"	2"	3"	4"	6"	8"	10"	12"	15"
Weight	6	7	12	16	30	67	133	196	314
B	3¼"	3½"	4"	4½"	5½"	6⅛"	8⅝"	10⅜"	12⅝"
C	6¾"	7"	7½"	8"	9"	10"	12"	14"	16½"





EIGHTH BENDS

Size	1½"	2"	3"	4"	6"	8"	10"	12"	15"
Weight	5	7	9	13	25	50	112	137	215
B	1⅝"	1⅞"	2⅜"	2⅞"	3¼"	3 11/16"	4⅛"	4¼"	5⅛"
C	5⅝"	5¼"	5 7/16"	5 11/16"	6 1/16"	8 13/16"	9¼"	9⅝"	10¾"



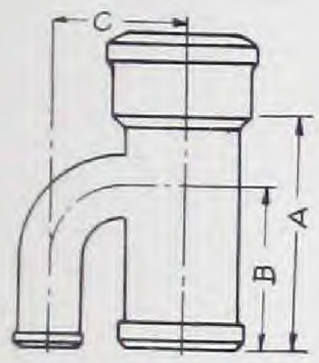
SIXTEENTH BENDS

Size	Wt.	B	C
1½"	4½	1"	4½"
2"	6	1⅛"	4⅝"
3"	9	1¼"	4 11/16"
4"	12	1⅜"	4 13/16"
6"	17	1½"	5"

For detail of Hub and Spigot See Page 8

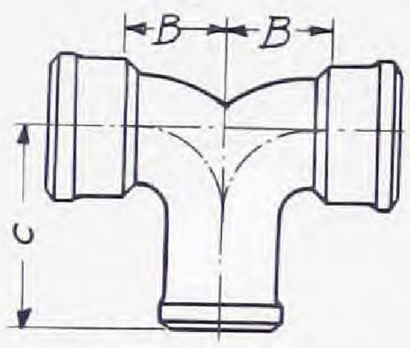
LONG SWEEP QUARTER BENDS

Size	Wt.	B	C
1½"	10	8¼"	11¾"
2"	12	8½"	12"
3"	19	9"	12½"
4"	28	9½"	13"
6"	50	10½"	14"



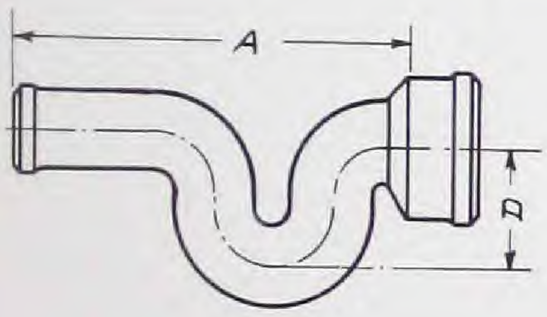
VENT BRANCHES

Size	Wt.	A	B	C
3"x2"	14	8⅜"	7½"	5"
3"x3"	18	10"	7½"	5½"
4"x2"	18	11"	8"	5½"
4"x3"	20	11"	8"	6"
4"x4"	26	11"	8"	6½"
6"x3"	32	13"	9"	7"
6"x4"	33	13"	9"	7½"
6"x6"	43	13"	9"	8½"



DOUBLE QUARTER BENDS

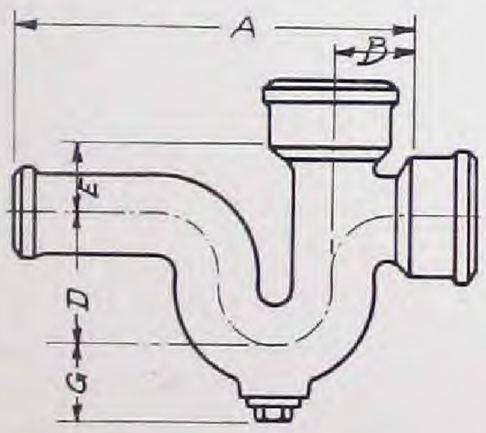
Size	Wt.	B+B	C
1½"	11	6½"	6¾"
2"	12	7"	7"
3"	17	8"	7½"
4"	25	9"	8"
6"	40	11"	9"



SANITARY RUNNING TRAP—NO VENT*

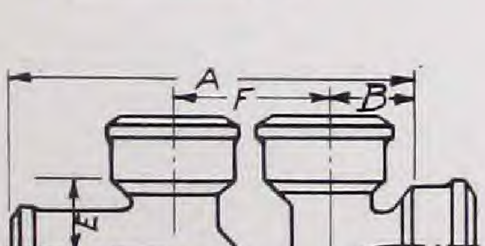
Size	Weight	A	D
1½"	9	12⅛"	4"
2"	13	13½"	4½"
3"	21	15½"	5½"
4"	40	17½"	6½"
6"	48	21½"	8½"

Minimum Depth of Seal on Traps is 2½".



SANITARY RUNNING TRAP—SINGLE HUB VENT*
(Showing Cleanout)

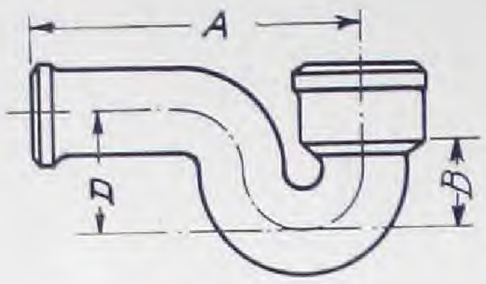
Size	Weight	Vent	A	B	D	E	G
1½"	13	1½"	12⅛"	1⅞"	4"	1⅞"	2¼"
2"	17	2"	16"	2½"	4½"	2½"	2½"
3"	27	3"	18¼"	3"	5½"	3¼"	3 9/16"
4"	43	4"	20½"	3½"	6½"	3½"	4 1/16"
6"	60	4"	24½"	4½"	8½"	4¼"	5 1/16"



SANITARY RUNNING TRAP—DOUBLE HUB VENT*

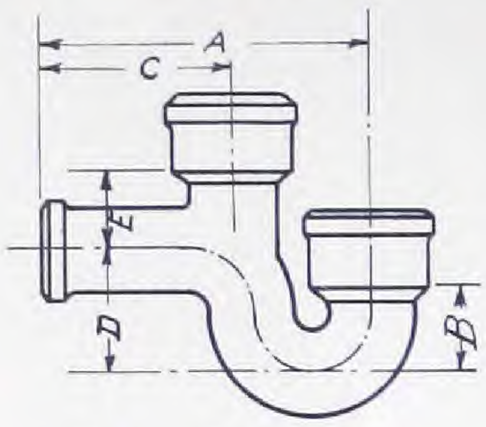
Size	Weight	Vent	A	B	D	E	F
1½"	16	1½"	12⅛"	1⅞"	4"	1⅞"	4¾"
2"	19	2"	13½"	2½"	4½"	2½"	5¼"
3"	32	3"	15½"	3"	5½"	3¼"	6¼"
4"	45	4"	17½"	3½"	6½"	3½"	7¼"
6"	68	4"	21½"	4½"	8½"	4¼"	8¼"
8"	187	6"	26⅞"	4⅝"	11"	4¼"	12"
10"	338	6"	33⅝"	5½"	13⅜"	5¾"	16"
12"	464	8"	36⅞"	6⅛"	16"	6⅝"	19"
15"	786	8"	44⅝"	6⅛"	19¼"	8⅛"	25"

*All traps are furnished with or without cleanout.



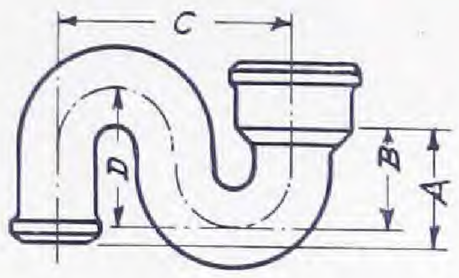
SANITARY P TRAP (OR ½ S TRAP)—NO VENT*

Size	Weight	A	B	D
1½"	8	10¼"	2⅜"	4"
2"	11	11"	3"	4½"
3"	19	12½"	4¼"	5½"
4"	27	14"	5½"	6½"
6"	35	17"	8½"	8½"



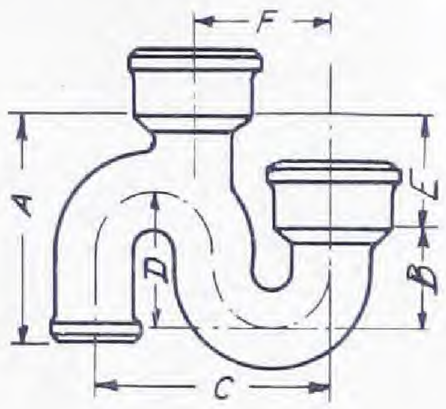
SANITARY P TRAP (OR ½ S TRAP)—HUB VENT*

Size	Weight	Vent	A	B	C	D	E
1½"	12	1½"	10¼"	2⅜"	6⅛"	4"	1⅝"
2"	15	2"	11"	3"	6¼"	4½"	2¼"
3"	24	3"	12½"	4¼"	6¼"	5½"	3"
4"	38	4"	14"	5½"	7"	6½"	3¼"
6"	54	4"	17"	8½"	8"	8½"	4"



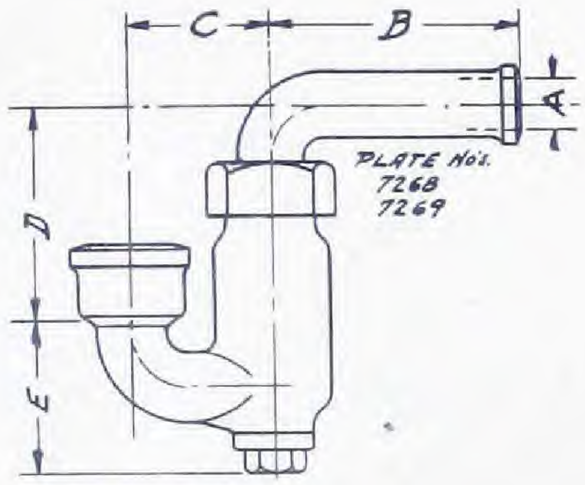
SANITARY S TRAP—NO VENT*

Size	Weight	A	B	C	D
1½"	9	5⅛"	2⅜"	7"	4"
2"	14	5½"	3"	8"	4½"
3"	22	6¼"	4¼"	10"	5½"
4"	32	7"	5½"	12"	6½"
6"	46	9"	8½"	16"	8½"



SANITARY S TRAP—HUB VENT*

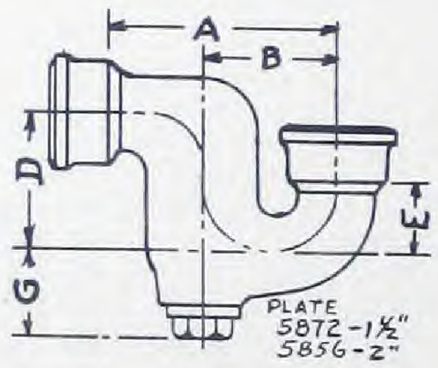
Size	Weight	Vent	A	B	C	E	F
1½"	13	1½"	8⅜"	2⅜"	7"	3¼"	4⅛"
2"	16	2"	9¼"	3"	8"	3¾"	4¾"
3"	28	3"	10½"	4¼"	10"	4¼"	6¼"
4"	39	4"	11¼"	5½"	12"	4¼"	7"
6"	57	4"	13"	8½"	16"	4"	9"

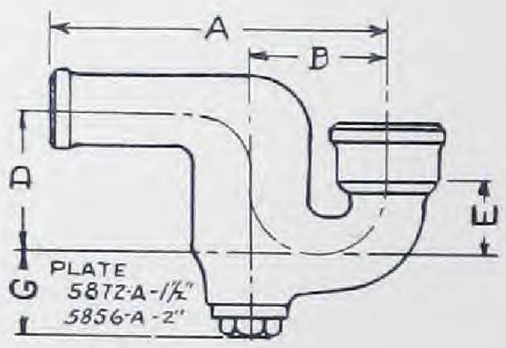


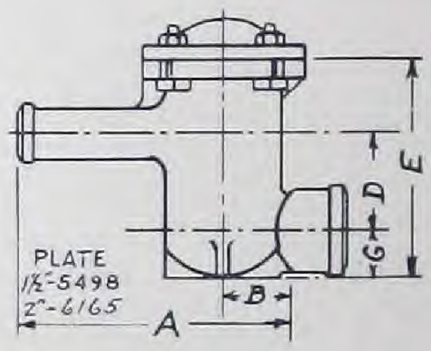
For detail of Hub and Spigot see page 8

NON-SYPHON P TRAP

Plate	A	B	C	D	E
7268	1½"	8"	4½"	6¾"	6¼"
7269	2"	8"	5½"	8¾"	8¾"



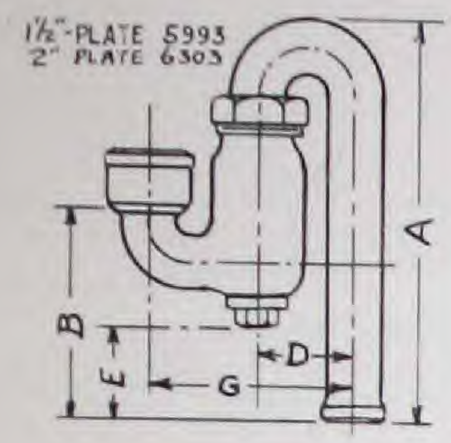




DRUM TRAPS

Plate	Size	Weight	A	B	D	E	G
5872	1½"	16	6⅝"	4¼"	4½"	1⅞"	3⅜"
5856	2"	22	7¾"	5"	4½"	2¼"	3 9/16"
5872-A	1½"	14	12¼"	4¼"	4½"	1⅞"	3⅜"
5856-A	2"	20	13¾"	5"	4½"	2¼"	3 9/16"
5498	1½"	27	11"	2⅝"	4"	9⅜"	2⅜"
6165	2"	31	11⅜"	2½"	4½"	10⅛"	2⅝"

*All traps are furnished with or without cleanout.



CENTRIFUGAL DRUM TRAP
(Non Syphon)

Plate	Size	Weight	A	B	D	E	G
5993	1½"	23	16½"	7¾"	4"	3¾"	8½"
5993-A	1½"	29	24½"	15¾"	4"	11¾"	8½"
6303	2"	38	20¼"	12½"	5½"	3¾"	11"
6303-A	2"	44	28¼"	20½"	5½"	11¾"	11"

SINK OUTLETS

Sink Outlet Plate 5588 is for use with wood, stone or metal sinks. It is to be bedded in proper acid-proof cement (such as a mixture of litharge and glycerine) and is fastened tightly by means of the lock nut. 1½" or 2" size.

Plate 6985 (for porcelain sinks).

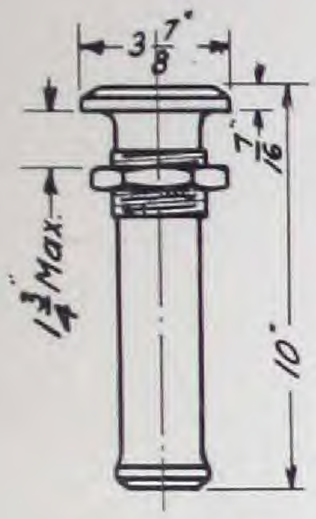


Plate 5588

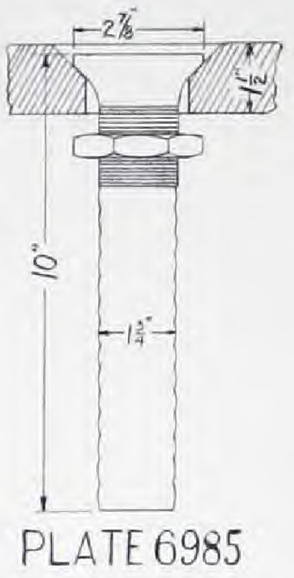


PLATE 6985

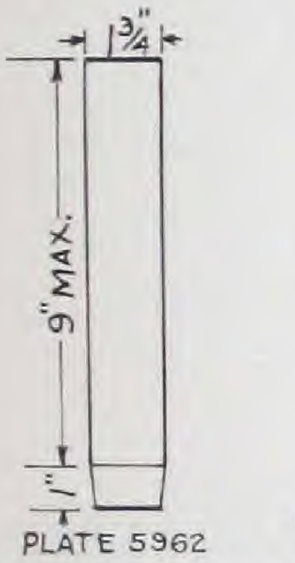


PLATE 5962

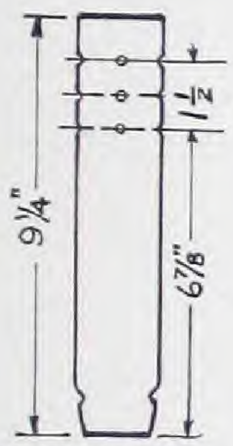


PLATE 7032

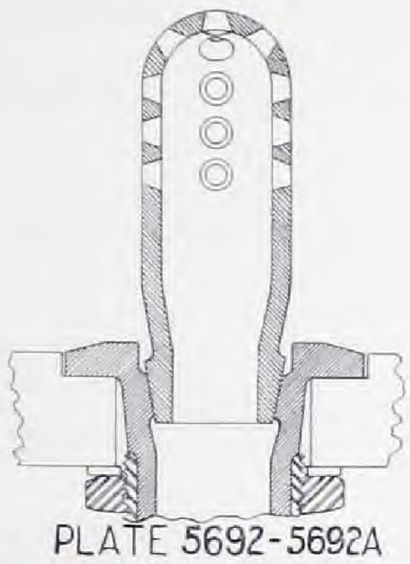


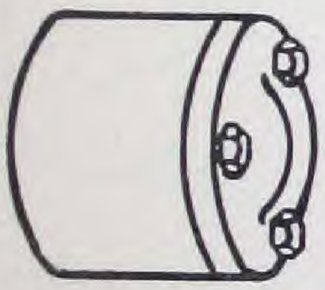
PLATE 5692-5692A

SINK OVERFLOWS
(To fit Outlet Plate 5588, as in drawing 5692-5692-A)

Plate	Height	Weight	Type
5962	9" max.	4	Open End
7032	8½"	4	Open End
5692	5½"	2	Bee Hive
5692-A	10"	4	Bee Hive

Plate 7032 is standard for New York City Schools.

DURIRON CLEANOUT PLUGS WITH BOLTED COVER



Except in extremely severe conditions we recommend the use of standard brass screwed cleanout plugs, since Duriron cannot be threaded. Inasmuch as these plugs are always exposed, they can be replaced readily if eaten out.

Size	1½"	2"	3"	4"	6"
Weight	2	2½	6½	11	14

LONG SINK TRAPS

These Sink Traps may also be furnished with flared end for standard sink coupling at same price as bell end shown.

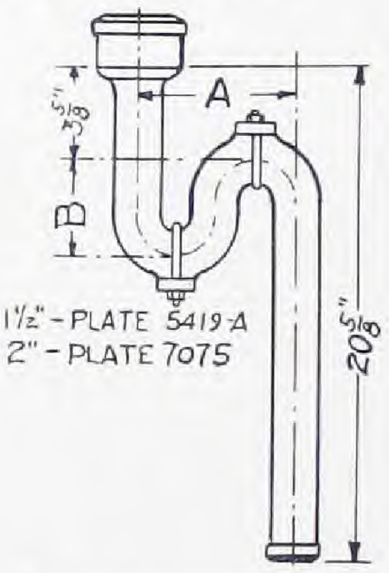


Plate	Size	A	B
5419-A	1½"	6¾"	4½"
7075	2"	7¾"	5"

DURIRON ROPE ASBESTOS PACKING

The Duriron Asbestos Packing is made from commercially pure asbestos, and is treated with special materials to make it most desirable for acid service. So that the correct amount may be calculated for the work, the following table of the requirements per joint is given.

Size of Pipe	1½"	2"	3"	4"	6"	8"
Weight in Lbs., per Joint	0.14	0.16	0.22	0.26	0.35	0.44
Length in Inches	10	12	16	19	26	33

One hundred feet (1200 inches) of this packing weighs 16 pounds.

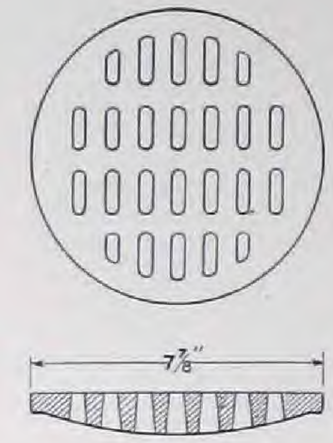
In the packing of a joint, in order to make sure that there is no open space left when this packing is put in the bottom of the bell or hub, we recommend that the packing be separated into two or three strands and laid in so that the ends will overlap, and surely make a joint all the way round.

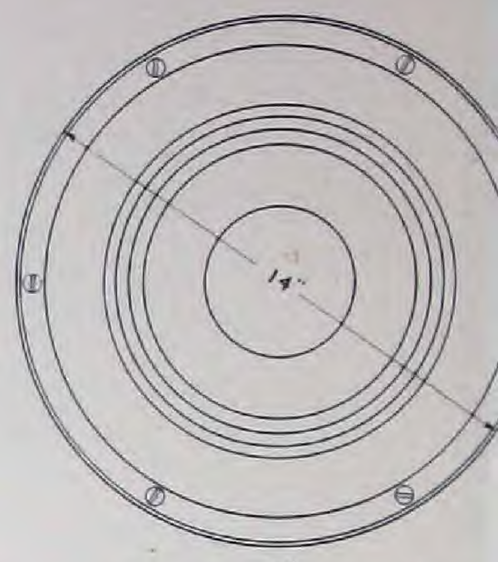
The amounts of packing given above, when caulked in tightly, fill up the bell or hub from 1½" to 1¾" from the top, which space is left for the lead backing.

Josam-Duriron Floor Drains

The highly efficient Josam type of floor drain (patented) is now produced in Duriron. Where floor drains must handle acids, it is now possible to have the combined advantage of this design with the material that is not affected by acid contact.

These are furnished with 2", 3", 4" and 6" outlet. The strainer plate in all sizes is 7⅞" diameter. They are produced in two types shown here. Type No. 5500 is to be used where there is no floor membrane. No. 5501 where there is a floor membrane. The principle embodied in this type of floor drain entirely prevents any chance of seepage.





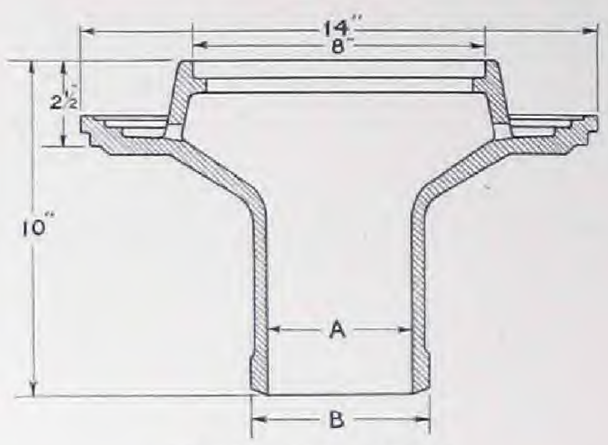


Plate No. 5500

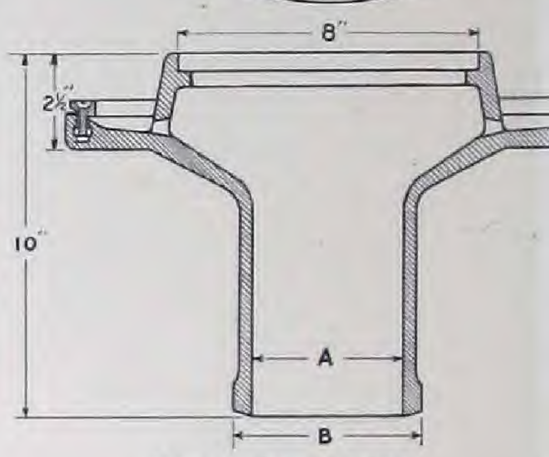
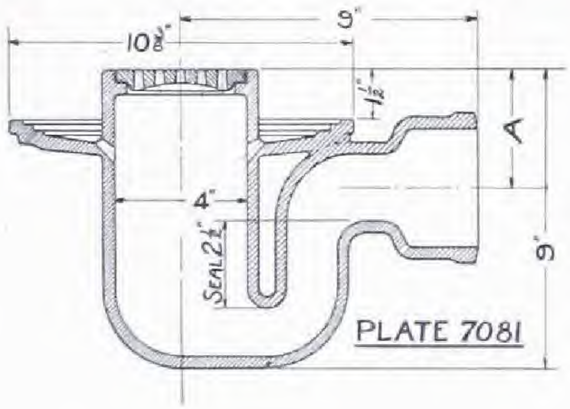


Plate No. 5501



Josam-Duriron Combination Drain and Trap

Plate	Size	A
7081-A	1½"	3⅞"
7081-B	2"	3⅝"

Plate	Size Outlet
5500-2	2"
5500-3	3"
5500-4	4"
5500-6	6"

Plate	Size Outle
5501-2	2"
5501-3	3"
5501-4	4"
5501-6	6"

Duriron Sinks—Flat Rim

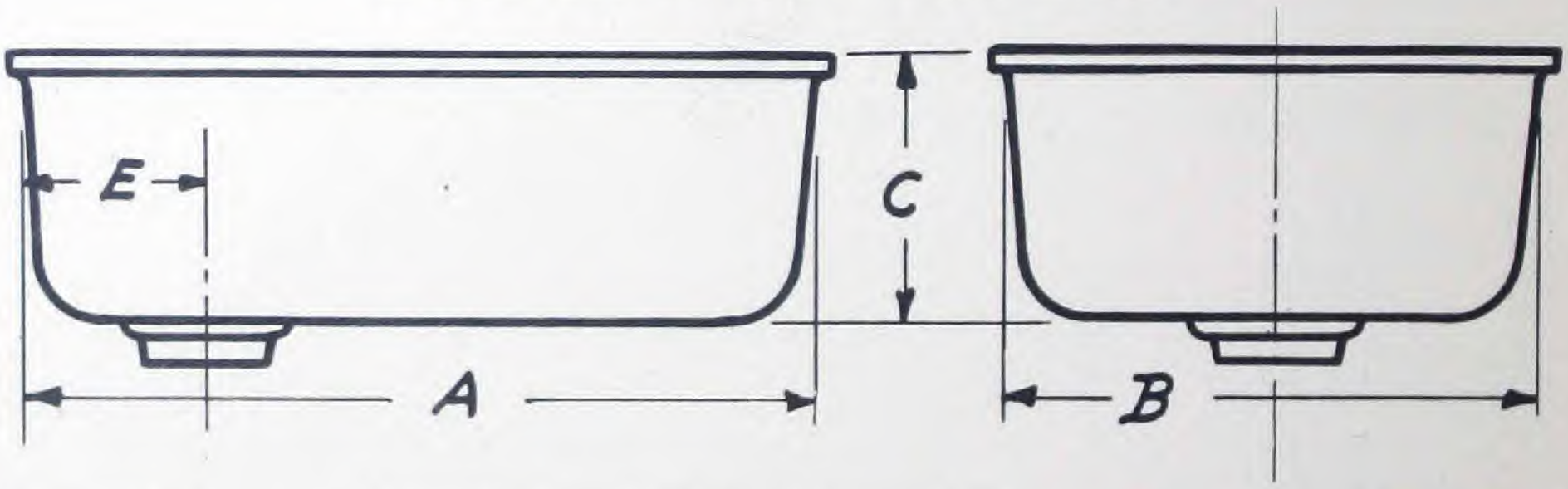


Plate	Weight	A	B	C	E
5851	72	16"	14"	8"	5⅜"
5852	103	24"	16"	8"	5 7/16"
5853	120	28"	16"	7"	5 7/16"
5964	73	17"	9"	10"	8½"
5172-D	240	37½"	19"	7¾"	7¼"
5172-C	300	38"	19½"	10¾"	7¾"

Hemispherical Laboratory Sinks

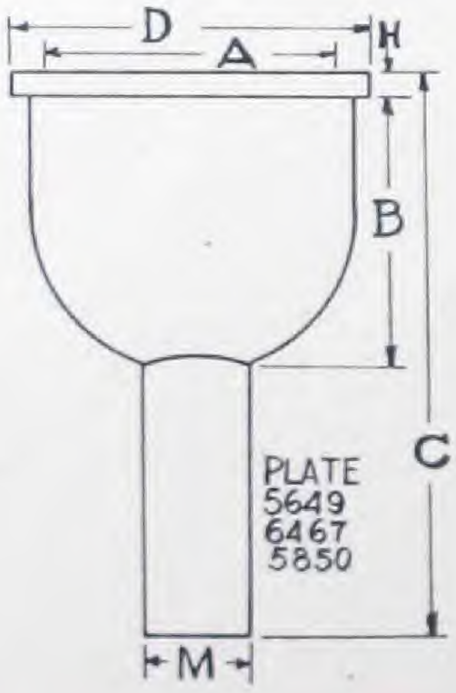
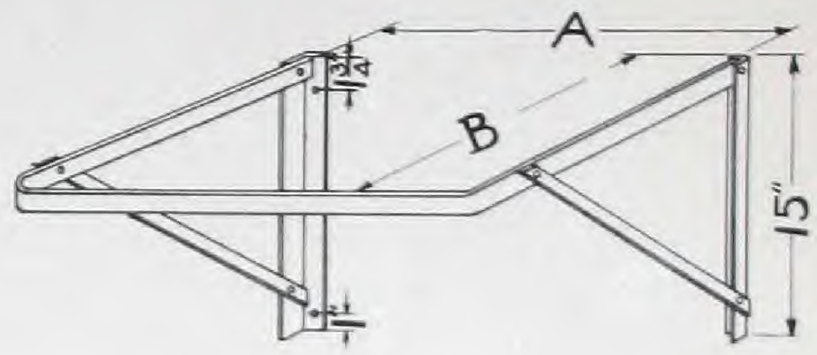


Plate	A	B	C	D	H	M
5649	5"	5"	11"	6¼"	⅜"	2¼"
6467	6"	6"	12"	7½"	½"	2¼"
5850	8"	4½"	10½"	9½"	½"	2¾"
5850-1½	8"	4½"	10½"	9½"	½"	2¼"
7332-1½	12"	6"	12"	13½"	⅝"	2¼"

STEEL BRACKETS FOR SINKS

(Painted Black)

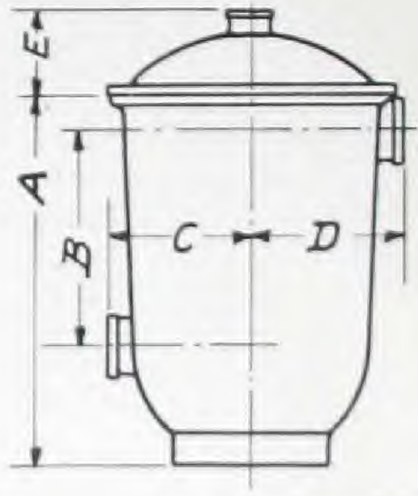
Size	To Fit Sink	A	B
1	5851	16⅛"	14⅝"
2	5852	24⅛"	16⅝"
3	5853	28⅛"	16⅝"
4	5964	17⅛"	9⅝"
5	5172-D	37⅝"	19⅝"
6	5172-C	38⅛"	20⅛"



DILUTION OR CATCH BASINS

Duriron Dilution or Catch Basins are produced in various sizes and forms. The requirements for these vary so widely that we show here only a typical Basin and Cover. The outlets to this style may be changed to suit.

Plate	Weight	A	B	C	D	E
5762	810	38¼"	21¾"	14½"	15½"	7⅜"



DEPARTMENT OF COMMERCE—BUREAU OF STANDARDS

Report on Corrosive Tests on Duriron

April 24, 1920. Duration of Tests, 120 Days

Solution	Concentration in % by Wt.	Original Wt. in Gms.	Loss in Wt. in Gms.	% Loss	Depth of Corrosion Inches per Year
Sulphuric Acid	95%H_2SO_4	116.5601	.008	.007	.0000206"
Sulphuric Acid	25%H_2SO_4	109.5050	.018	.016	.0000463"
Sulphuric Acid	10%H_2SO_4	103.4191	.026	.025	.0000685"
Nitric Acid	70%HNO_3	108.7927	.007	.006	.0000188"
Nitric Acid	25%HNO_3	108.4709	.008	.007	.0000206"
Nitric Acid	10%HNO_3	110.4582	.000	no loss	None
Hydrochloric Acid	5%HCL	106.1607	1.234	1.162	.00324"
Acetic Acid	99%CH_3COOH	111.9367	.007	.006	.0000188"
Phosphoric Acid	87%H_3PO_4	111.7125	.007	.006	.0000188"
Phosphoric Acid	25%H_3PO_4	113.7571	.011	.010	.0000292"
Phosphoric Acid	10%H_3PO_4	111.3789	.009	.008	.000024"
Oxalic Acid	7.9%$(COOH)_2.2H_2O$	112.9180	.016	.014	.0000412"
Oxalic Acid	2.1%$(COOH)_2.2H_2O$	109.4271	.014	.013	.000036"
Aluminum Potassium Sulphate	15%$Al_2(SO_4)_3K_2SO_4.24H_2O$	114.4460	.007	.006	.0000188"
Picric Acid	9.1%$OH.C_6H_2(NO_2)_3$	103.9213	.005	.005	.0000137"
Copper Sulphate	25%$Cu.SO_4.5H_2O$	117.8332	.009	.008	.0000223"
Ammonium Chloride	27%NH_4CL	103.1788	.037	.026	.0000977"
Ferric Chloride	48%Fe_2CL_6	111.2925	.015	.013	.0000395"
Ferric Chloride	7%Fe_2CL_6	113.6637	.018	.016	.0000463"
Oleic Acid	Commercial Oleic	108.9583	.003	.003	.00000857"

The column above, "Depth of Corrosion, Inches per Year," was worked out so that the practical permanence of Duriron may be readily visualized.

PART II—VENTILATION

Duriron Acid-Proof Exhaust Fans

For the ventilation of laboratory hoods, pickling rooms, and other places from which it is necessary to remove corrosive fumes, an exhauster should be provided that will not be affected in any part by the gases it handles.

Duriron fans are especially designed with this object in view.

Being cast from an acid-proof metal in all parts coming in contact with the fumes, they require no protective lining or coating, and are permanently free from attack by corrosion.

They are compact and sturdy, with runner carefully designed for the best efficiency, and require no attention beyond an occasional oiling of the bearings.

The capacity tables on pages 17 and 18, give volume and brake horse power of the various sizes, over the range of speeds at which they will operate with economy.

Since it is possible for a fan to deliver more or less air at the same static pressure, due to variations in pipe sizes, bends, etc., the table shows total pressures under the various conditions. The total pressure remains constant for any given speed, and is the sum of the static pressure and velocity pressure.

The capacity table shows the actual brake horse power consumed by the fan under test conditions. Because the impeller is mounted directly on the motor shaft, the three smaller sizes are equipped with oversize motors.

This makes possible more rugged construction, reduces vibration to a minimum, and eliminates motor trouble.

DESIGN OF AN ACID VENTILATING SYSTEM

For any ventilating system it is good practice to design the piping so that the velocity in the ducts will not exceed thirty feet per second.

For particularly noiseless installations the velocity should be kept well below this figure. The same consideration governs the selection of a fan. Lower speed means less wear and quieter operation.

SELECTING A FAN FOR A CHEMICAL HOOD

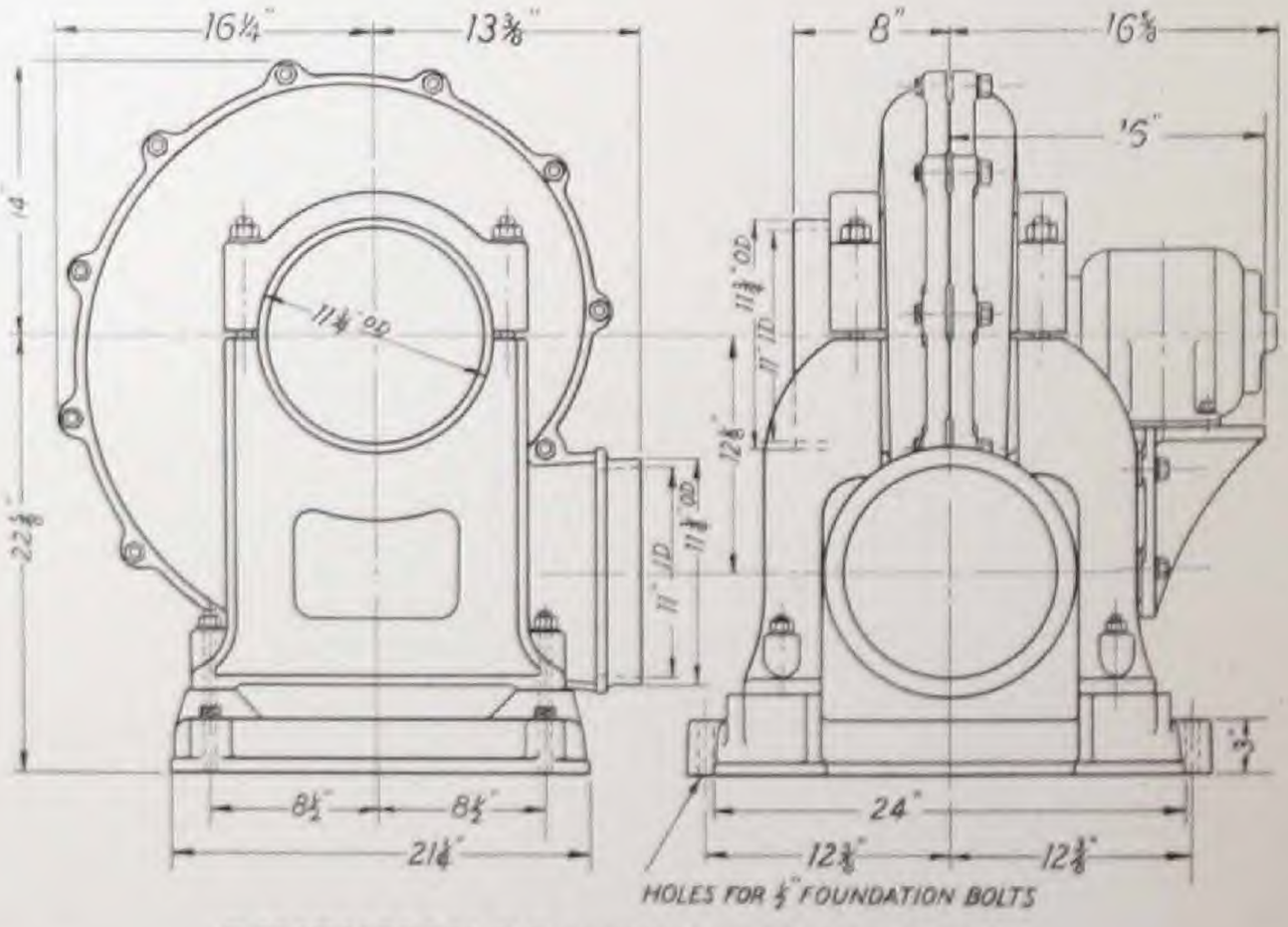
Experience has shown that all fumes will be prevented from escaping into the laboratory when an inward velocity of sixty feet per minute is maintained through all openings in the hood.

For the usual school or college laboratory a velocity of forty feet per minute is ample. The size of the fan, therefore, will depend on the method of use of front doors, amount of leakage into hood, etc.

ARRANGEMENT OF DUCTS

Where possible, the minimum radius of bends in piping should equal diameter of the pipe, and the number of bends should be kept as low as possible. Care should be used to avoid sharp corners at entrance to suction pipes. When drawing fumes from a hood, the edges of the opening in the hood should be widely flared, and the pipe should not extend into the hood.

DURIRON FAN No. 150-A



DIMENSION DRAWING FAN No. 150-A

REQUIREMENTS FOR VENTILATION

For thorough ventilation of a laboratory, pickling room, or other place where poisonous fumes are present, the air should be completely changed about every one and a half minutes. For less severe conditions, an air change once in four to six minutes will generally be satisfactory.

Provision should be made for an inlet into the room of an equal amount of air to that being exhausted.

TABLE ONE

A CAPACITY IN CUBIC FEET PER MINUTE	STATIC PRESSURE INCHES OF WATER	B* TOTAL PRESS. INCHES OF WATER	C SIZE OF MOTOR H.P.	D** SPEED R.P.M.	E DIAM OF SUCTION INCHES	F DIAM OF DISCH. INCHES	G DIAM OF DUCTS INCHES
62	3/32	3/16	1/6	1450	3	3	3
75	1/8	1/4	1/6	1740	3	3	3
300	1/4	3/8	1/2	1160	6	6	6
375	3/8	9/16	1/2	1450	6	6	8
450	9/16	15/16	1/2	1740	6	6	8
1300	15/16	1 5/32	1	1160	12	12	12
1600	1 3/8	1 5/8	1	1450	12	12	14
1900	2	2 7/16	1 1/2	1740	12	12	14
3200	13/16	1 1/8	2	1160	16	15	18
3850	1 1/4	1 11/16	5	1450	16	15	20
4800	1 13/16	2 1/2	5	1740	16	15	22

TYPICAL FAN SPECIFICATIONS

The following form of specification may be used with the assurance that the fan furnished thereunder will give the maximum of service under the most severe conditions.

To use this form it is only necessary to decide on the capacity wanted, locate it in column "A" of "Table One" above; then to fill in the blank spaces with the quantities in the appropriate columns on the same line of this table.

(More complete information as to the performance of the Duriron fans will be found under "Capacity Tables" on the page following.)

"Contractor will furnish and install exhaust fans for removing fumes from .....

"Such fans are to be located as shown on drawings, and shall be so designed and constructed that all parts exposed to the fumes passing through them shall be made of a cast alloy of iron equal to **Duriron** as made by The Duriron Company, Inc., Dayton, Ohio, and showing the following analysis:

Silicon .....above	14.25%
Carbon .....below	0.80%
Manganese .....below	0.50%
Sulphur .....below	0.08%
Phosphorus .....below	0.20%

"Each fan shall have a capacity of (A) cubic feet of air per minute at a total pressure of (B) inches of water.

"Each fan shall be direct connected to a (C) horse power (....cycle, ...phase, ...volts, alternating current) (....volt, compound wound, direct current*** motor), having a full-load speed of (D) revolutions per minute.**

"The size of fan suction opening shall be (E) inches diameter, and of the discharge opening (F) inches diameter, connecting to main suction and discharge pipes (G) inches diameter.

"A layer of compressed cork flooring, or other approved material, shall be placed under each fan and motor, foundation bolts passing through said cork or other material, each foundation bolt provided with a cork or other approved washer."

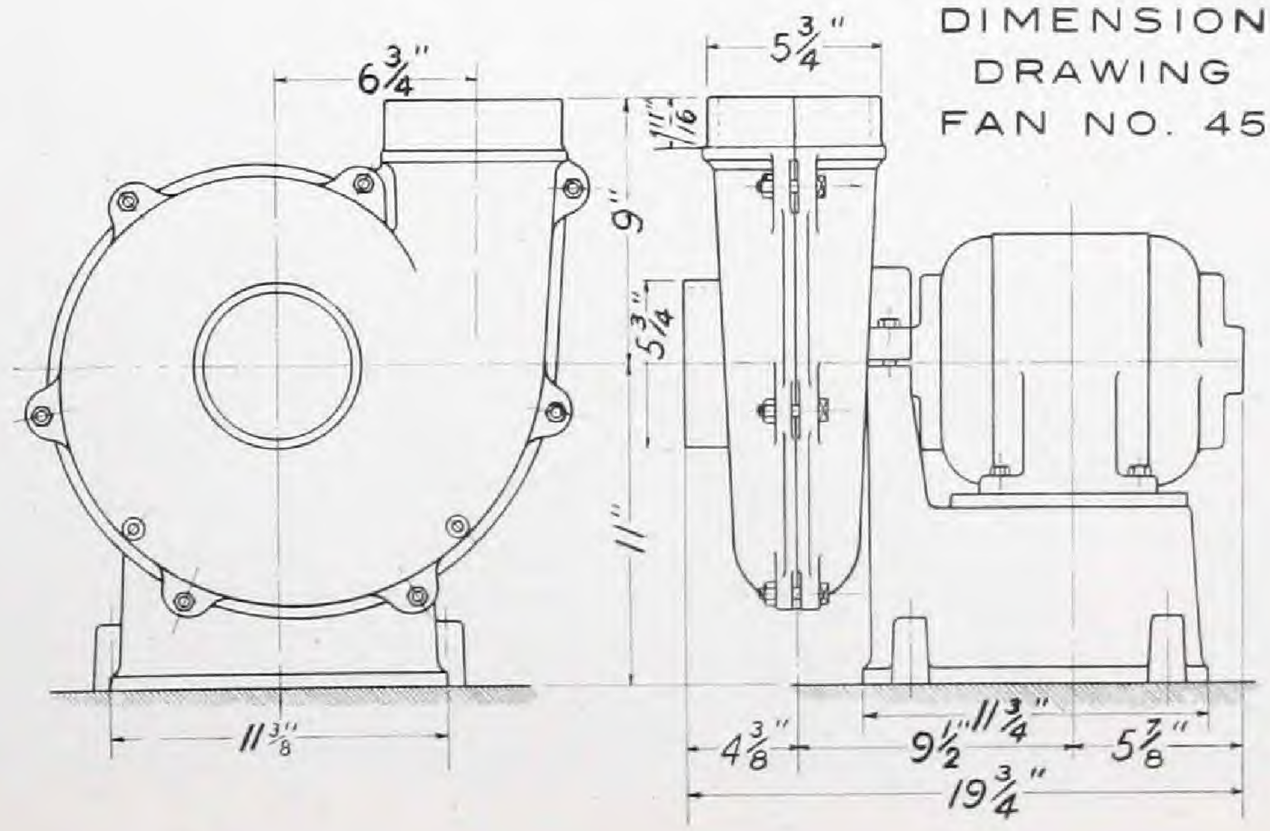
*Total pressure is the sum of static pressure and velocity pressure. Total pressure remains constant at a given speed, while static pressure may vary with pipe conditions.

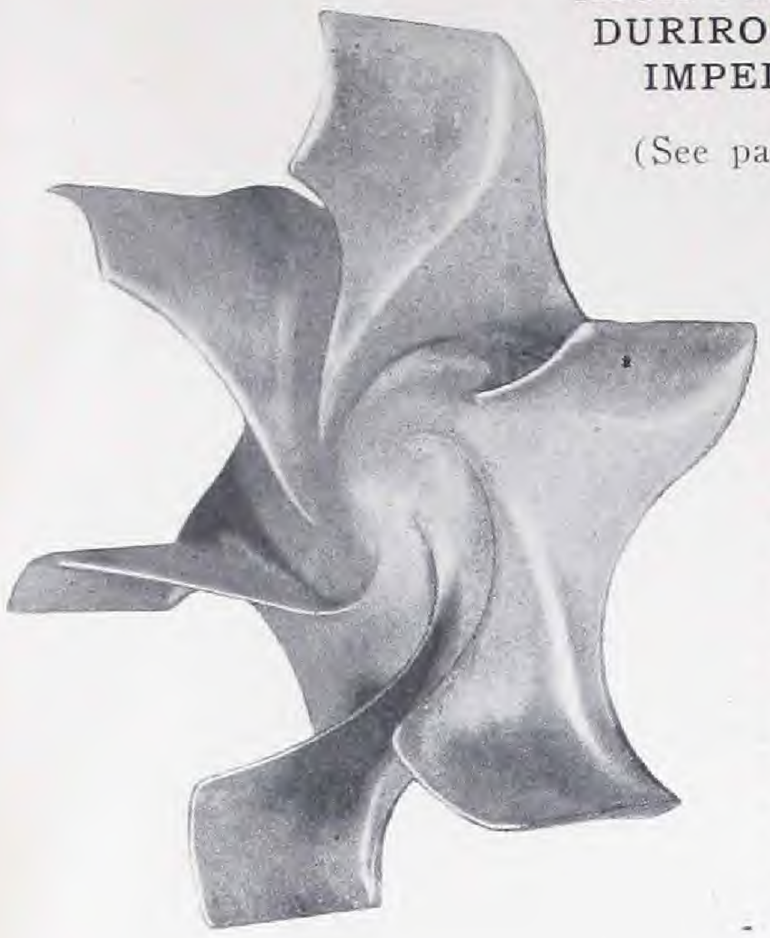
**When using alternating current bear in mind that the speed varies with the cycles of the current. Speeds of 1160 and 1740 are standard for 60 cycles; 1450 r. p. m. for 25 or 50 cycles.

***Starting rheostat is required on direct current motors of ½ H. P. and over.

DURIRON FAN No. 45

DIMENSION DRAWING FAN NO. 45



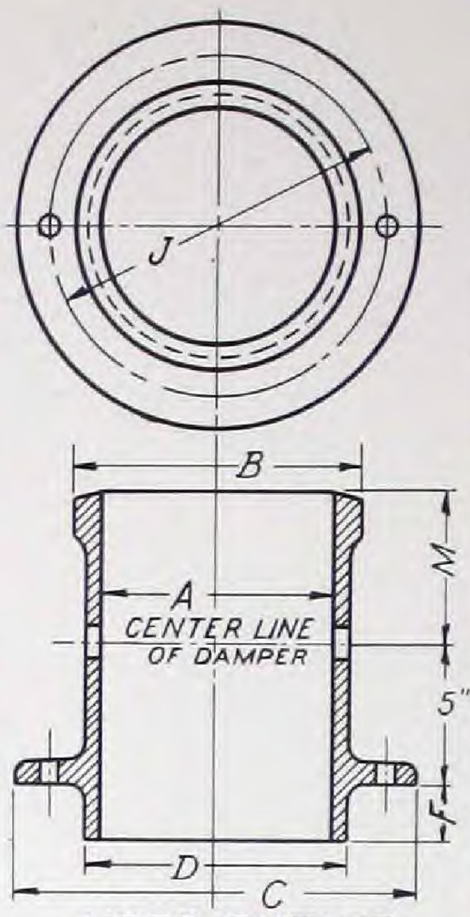


HIGH PRESSURE DURIRON FAN IMPELLER

(See page 19)

HOW TO USE FAN TABLES

Since Duriron fans may be had in belt driven type, the tables below give full data on their performance over the range of economical speeds. A note beneath table gives the method of converting to static pressure. For example, the No. 45 will give 200 ft. per minute against a static pressure of 1 in. of water, when operated at 1498 r. p. m.



HOOD OUTLET
PLATES - 6926-A - 7055 - 7056

DURIRON HOOD OUTLET

See illustration of Duriron equipped laboratory hood on page 19. The dampers are lettered "C-C" in the illustration.

Plate Number	7055	6926-A	7056
A	3"	4"	6"
B	3 7/8"	4 7/8"	7 1/8"
C	5 1/4"	6 7/8"	10"
D	3 1/2"	4 1/2"	6 5/8"
F	1"	1"	1"
G	1 7/8"	2 3/8"	3 7/16"
J	4 3/8"	5 3/4"	8 5/8"
M	7 5/8"	7 1/8"	12 1/8"

CAPACITY TABLES

Nº 45 FAN

VOLUME	OUTLET VELOCITY	T.P. 1/8"		T.P. 1/4"		T.P. 3/8"		T.P. 1/2"		T.P. 5/8"		T.P. 3/4"		T.P. 7/8"		T.P. 1"		T.P. 1 1/8"		T.P. 1 1/4		T.P. 1 1/2"	
		R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.
100	510	830	0.01	918	0.01	1000	0.01	1080	0.02	1157	0.02	1250	0.02	1330	0.03	1420	0.03	1510	0.04	1590	0.04	1720	0.05
150	760	832	0.01	920	0.02	1003	0.02	1082	0.02	1160	0.02	1252	0.03	1335	0.03	1425	0.04	1512	0.05	1592	0.05	1725	0.06
200	1020	860	0.02	951	0.02	1028	0.02	1105	0.03	1189	0.03	1268	0.04	1360	0.04	1450	0.05	1537	0.06	1613	0.07	1740	0.07
250	1280	917	0.02	1008	0.02	1086	0.03	1160	0.04	1240	0.04	1320	0.05	1418	0.06	1498	0.06	1580	0.07	1653	0.08		
300	1530	988	0.03	1079	0.04	1160	0.04	1233	0.05	1308	0.05	1392	0.06	1482	0.07	1555	0.08	1635	0.09	1700	0.10		
350	1810			1160	0.05	1242	0.05	1315	0.06	1395	0.07	1475	0.07	1557	0.08	1626	0.10	1700	0.11	1770	0.13		
400	2040							1415	0.07	1496	0.08	1570	0.09	1642	0.10	1708	0.12	1760	0.14				
420	2140							1450	0.08			1610	0.10	1680	0.11	1740	0.13						

Nº 150-A FAN

VOLUME	OUTLET VELOCITY	T.P. 1/4"		T.P. 1/2"		T.P. 3/4"		T.P. 1"		T.P. 1 1/4"		T.P. 1 1/2"		T.P. 1 3/4		T.P. 2"		T.P. 2 1/4"		T.P. 2 1/2"		T.P. 2 3/4"	
		R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.
200	255	650	0.08	790	0.12	915	0.16	1025	0.23	1130	0.25	1234	0.29	1333	0.34	1438	0.39	1531	0.46	1628	0.52	1712	0.60
400	510	660	0.08	800	0.12	925	0.16	1032	0.23	1138	0.25	1245	0.30	1340	0.35	1447	0.39	1538	0.47	1634	0.54	1716	0.62
600	765	680	0.10	815	0.14	936	0.18	1043	0.25	1150	0.28	1259	0.33	1350	0.38	1457	0.44	1546	0.52	1641	0.60	1722	0.72
800	1020	700	0.13	830	0.17	954	0.22	1060	0.28	1168	0.34	1275	0.38	1367	0.43	1470	0.51	1558	0.61	1650	0.72	1730	0.87
1000	1275	725	0.17	855	0.23	977	0.27	1079	0.33	1179	0.40	1295	0.45	1388	0.52	1490	0.61	1578	0.74	1663	0.88	1741	1.05
1200	1530	765	0.23	890	0.29	1005	0.35	1108	0.41	1218	0.49	1320	0.56	1415	0.65	1517	0.75	1600	0.90	1680	1.05		
1400	1785	820	0.30	940	0.37	1043	0.43	1141	0.51	1251	0.59	1355	0.68	1453	0.80	1549	0.93	1626	1.09	1702	1.28		
1600	2040	880	0.39	1000	0.46	1096	0.54	1190	0.61	1300	0.72	1400	0.84	1500	0.97	1584	1.11	1655	1.30	1724	1.50		
1800	2295			1070	0.56	1162	0.65	1256	0.75	1360	0.87	1455	1.01	1549	1.15	1625	1.32	1691	1.50				
2000	2550			1150	0.65	1240	0.78	1335	0.90	1432	1.05	1520	1.18	1602	1.35	1670	1.56	1731	1.78				
2200	2805							1421	1.15	1509	1.22	1590	1.38	1658	1.56	1720	1.77						

Nº 450 FAN

VOLUME	OUTLET VELOCITY	T.P. 1/2"		T.P. 3/4"		T.P. 1"		T.P. 1 1/4"		T.P. 1 1/2"		T.P. 1 3/4"		T.P. 2"		T.P. 2 1/4"		T.P. 2 1/2"		T.P. 3"		T.P. 3 1/2"	
		R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.	R.P.M.	B.H.P.
500	407	628	0.12	775	0.27	928	0.35	1027	0.45	1110	0.60	1186	0.70	1264	0.85	1332	1.00	1400	1.15	1533	1.45	1650	1.80
1000	814	633	0.16	783	0.32	942	0.45	1032	0.53	1119	0.68	1191	0.80	1268	0.97	1337	1.10	1405	1.25	1539	1.55	1653	2.00
1500	1221	650	0.25	802	0.42	964	0.55	1048	0.64	1133	0.80	1204	1.00	1273	1.15	1348	1.30	1416	1.50	1550	1.80	1662	2.25
2000	1628	681	0.45	831	0.60	995	0.72	1080	0.85	1160	1.05	1232	1.25	1310	1.43	1370	1.60	1440	1.75	1565	2.15	1678	2.65
2500	2035			872	0.85	1038	1.00	1122	1.20	1196	1.32	1270	1.60	1347	1.75	1403	1.95	1468	2.15	1588	2.60	1700	3.15
3000	2442					1094	1.35	1177	1.50	1243	1.75	1320	2.00	1389	2.18	1446	2.35	1506	2.60	1625	3.15	1734	3.70
3500	2849					1160	1.75	1240	2.00	1300	2.20	1373	2.45	1443	2.65	1497	2.90	1557	3.10	1670	3.75		
4000	3256									1362	2.75	1435	3.00	1500	3.25	1558	3.50	1612	3.75	1730	4.45		
4500	3663									1430	3.30	1500	3.70	1570	3.95	1626	4.25	1688	4.50				
5000	4070													1645	4.75	1720	5.30	1760	5.00				

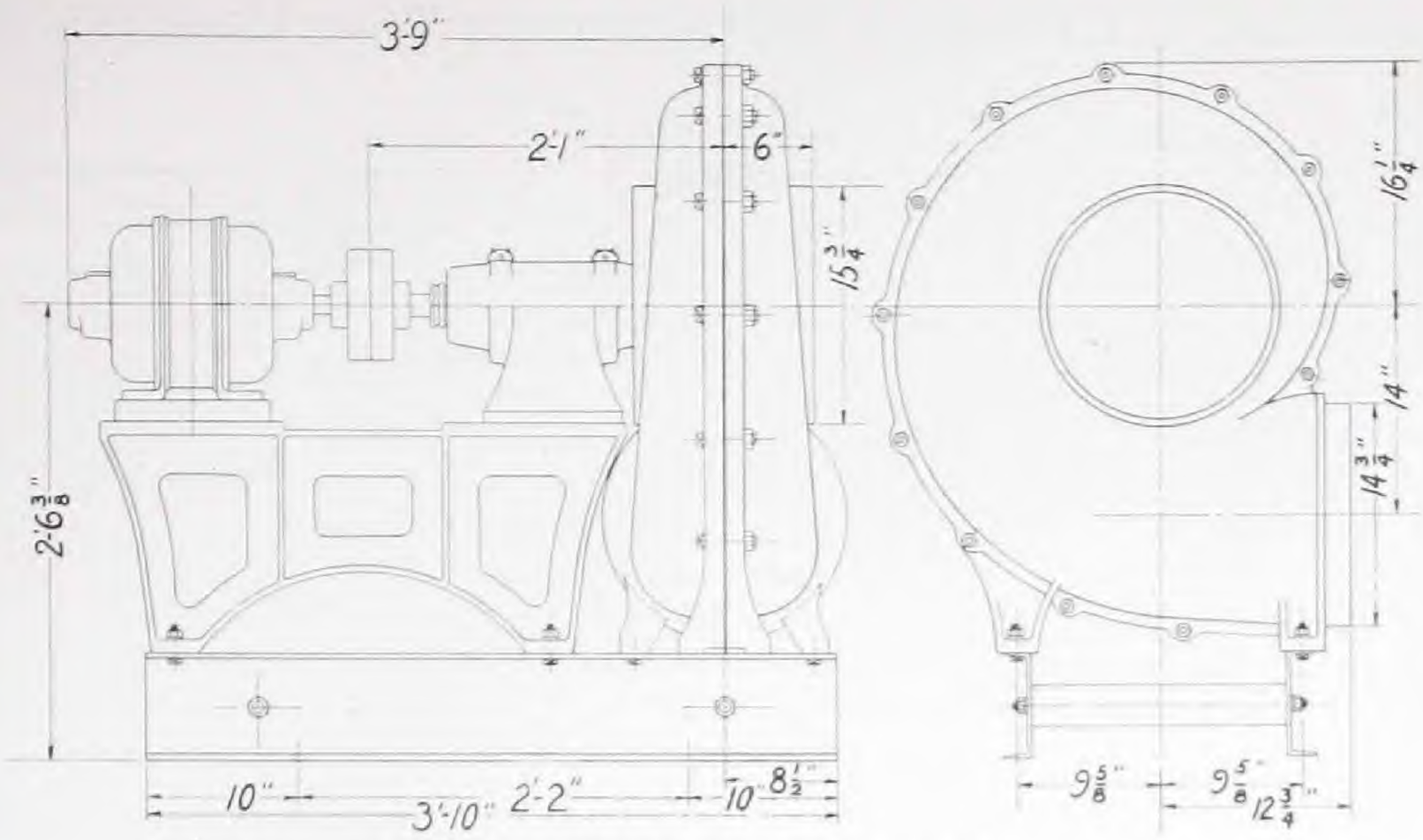
ABOVE TABLES GIVE TOTAL PRESSURE. TO USE WITH STATIC PRESSURE - DEDUCT FROM INDICATED CAPACITY
50 CU.FT. FOR No 45 FAN, 350 CU.FT. FOR No. 150-A FAN, 600 CU.FT. FOR No. 450 FAN.

All Duriron Exhaust Fans except No. 12 (3" suction and discharge) may be furnished for belt drive if desired.

HIGH PRESSURE TYPE OF FAN IMPELLERS

The design of the Duriron Fan Impellers is a radical change from the radial vane type commonly used in exhausters.

This design was adopted after careful tests, using both types in the same casing; and it was proven both to be stronger than the radial vane type, and more efficient.



DIMENSION DRAWING FAN No. 450

This phantom view of a laboratory fume hood illustrates the completeness and the carefully worked out detail of Duriron equipment that greatly improves operating conditions.

A hood equipped as in the illustration operates with no escape of noxious gases into the laboratory.

The exhaust fan draws the fumes from the collector box "D."

The draft is regulated by the dampers "C-C" in the hood outlet. (See dimensioned drawing on page 18.)

By providing a sliding damper in the bottom of collector box it is possible to produce draft in the bottom of hood through the Duriron draft tubes "A-A," thus removing the heavy gases immediately.

The small hemispherical sinks "B-B" are a great convenience in the hood. Fuming liquids are dashed in these without carrying to an outside sink. These sinks will of course withstand the action of hot and undiluted acids encountered in this service. (See dimensions of these on page 14.)

The great increase in the use of corrosive acids and alkalis in educational laboratory work results in a corresponding need for the most resistant of materials to eliminate heavy upkeep charges.

DURIRON EQUIPPED LABORATORY HOOD

A Partial List of Architects and Engineers Who Have Specified Duriron

ALABAMA
William L. Denham
D. O. Whilldin

ARIZONA
J. B. Lyman

CALIFORNIA
Allison & Allison
J. C. Austin
W. Horace Austin
George Atkins
Charles H. Biggar
Edwin Bergstrom
Binder & Curtis
Charles W. Dickey
J. J. Donovan
R. C. Farrell
Farrell & Miller
Thomas C. Kistner
Krempel & Erkes
F. G. Krucker
E. J. Kump Company
G. Albert Lansburgh
Leland & Haley
N. F. Marsh
Mott M. Marston
George B. McDougall
Henry H. Meyers
R. H. Orr
Russell & Alpaugh
Reed & Corlett
Sauter & Lockard
W. P. Shepherd
Truesdell, Purinton & Newton
W. H. Weeks
Wells & Cass
G. Stanley Wilson

COLORADO
MacLaren & Hetherington

CONNECTICUT
Caldwell, Walker & Beckwith

DISTRICT OF COLUMBIA
Snowden Ashford
R. F. Beresford

FLORIDA
F. H. Trimble

GEORGIA
William J. J. Chase
Edwards & Sayward
Hentz, Reid & Adler
Lockwood, Greene & Co.
Roberts & Co.
Wallin & Comer

ILLINOIS
J. A. Chiaro
John D. Chubb
John C. Christensen
Davidson & Weiss
Graham, Anderson, Probst & White
Halperin & Braun
Holabird & Roche
John Howatt
Jarvis Hunt
Scott Joy
I. C. Llewellyn
Joseph McCarthy
A. F. Moratz & Co.
Peterson & Johnson
Shankland & Pingrey
Schmidt, Garden & Martin
J. D. Small
H. H. Von Holst

INDIANA
Johnson, Miller & Miller
William E. Russ

IOWA
W. J. Brown
Dougher, Rich & Woodburn
Eugene F. Gier
William Gordon
Proudfoot, Bird & Rawson
H. E. Reimer

KANSAS
Lorentz Schmidt & Co.

KENTUCKY
Arthur Tafel

LOUISIANA
C. Scott Yeager
Theo. C. Link

MAINE
Harry S. Coombs

MARYLAND
Henry Adams
E. H. Glidden
James Posey
Owens & Sisco
Parker, Thomas & Rice
Chas. L. Reeder
Sill-Buckler & Fenhagen

MASSACHUSETTS
Allen & Collens
Bigelow & Wadsworth
Desmond & Lord
W. C. & G. C. Gardner
E. P. T. Graham
Thomas M. James Company
Richard D. Kimball Company
Maginnis & Walsh
Ritchie, Parsons & Taylor
Stone & Webster
Edward L. Wilson

MICHIGAN
Andrew Clubb
Cowles & Mutscheller
Donaldson & Meier
Albert Kahn
R. A. LeRoy
Malcomson, Higginbotham & Palmer
McColl, Snyder & McLean
Smith, Hinchman & Grylls
H. H. Turner
Williamson, Crow & Proctor

MINNESOTA
W. T. Bray
Gaarder & Gaarder
German & Jenssen
Holstead & Sullivan
Chas. L. Pillsbury
Tyrie & Chapman

MISSOURI
Barnett, Haynes & Barnett
J. F. Jameson
Owen, Payson & Carswell
Chas. A. Smith

NEBRASKA
Clarke & Clarke
A. H. Dyer
Fiske & Meginnis
John Latenser & Son
Chas. W. Wurdeman

NEW JERSEY
C. V. R. Bogert
Guilbert & Betelle
John T. Rowland
V. B. Smith

NEW YORK
Carl C. Ade
Associated Architects of Buffalo
Donn Barber
Beck & Tinkham
George & Edward Blum
Buchman & Kahn
Clark, MacMullen & Riley
G. H. Chamberlain
Coffin & Coffin
Delano & Aldrich
N. L. Englehardt
C. P. H. Gilbert
William S. Gregory
Dr. S. S. Goldwater
Bertram H. Goodhue
William H. Gompert
Gordon & Kaelber
Harry M. Haskell
Hyde & Shepherd
Johnson & Ford
Sullivan W. Jones
Jaros & Baum
Lockwood, Greene & Co.
T. C. Lacey & Son
Magusen & Kleinert
McKenzie, Vorhees & Gmelin
McKim, Mead & White
Thomas E. Murray, Inc.
Niles & Daly
Werner Nygren
Pierce & Bickford
Patton & Blair
Renwick, Aspinwall & Tucker
Rogers & Smith
J. M. Ryder
A. W. E. Schoenberg
Timmis & Chapman
Leon Stern
Visscher & Burley
W. Whitehill
York & Sawyer

NORTH CAROLINA
Nelson & Cooper
W. G. Rogers
E. G. Stillwell

OHIO
Ray P. Barber
Hubbell Bennes Company
DeVoss & Donaldson
Fosdick & Hilmer
Edwin M. Gee
W. P. Ginther
F. F. Glass
H. R. P. Hamilton
Hermann & Brown
O. D. Howard
Howell & Thomas
Jos. E. Lowes, Inc.
W. R. McCornack
Thomas D. McLaughlin
Miller & Son
Mills & Millspaugh
W. H. Nicklas
The Owsley Company
Frank L. Packard
Fred J. Porter
W. E. Prindle Company
Pretzinger & Musselman
T. R. Ridley
Richards, McCarty & Bulford
Granville E. Scott
Schenck & Williams
J. F. Sheblessy
Frank Hill Smith
R .L. Silsbee
Walker & Norwick
Franz C. Warner

OREGON
A. E. Doyle
Raymond Hatch
Jay Keller
Knighton & Howell

PENNSYLVANIA
Ballinger Company
Boyd Abel & Gugert
C. W. Bolten & Sons
Carlisle & Sharrer
J. D. Cassell
Paul A. Davis, 3rd, & Dunlap
F. Ferdinand Durang
W. G. Eckles
I. Hathaway Francis
Heacock & Hokanson
Ingham & Boyd
Paul Irwin
F. F. Kauffman
A. E. Kinzey
Maurice E. Kressly
Edward Langley
Lawrie & Green
Michler & Snyder
Julian Millard
Frederick A. Muhlenberg
O. Randolph Parry
E. G. Perrot
E. H. Poggi
D. G. Puderbaugh
Ritchie & Eiler
E. Z. Scholl
George Schwan
James T. Steen & Son
Simon & Simon
J. T. Windrim
Clarence E. Wunder
F. C. Vogan

RHODE ISLAND
R. C. N. Monahan

SOUTH CAROLINA
Casey & Fant
A. D. Gilchrist
C. G. Sayre

SOUTH DAKOTA
Perkins & McWayne

TENNESSEE
D. R. Beeson
R. H. Hunt & Co.
C. F. Jones
W. H. Sears

TEXAS
A. C. Finn
Herbert M. Greene Company

VIRGINIA
Carneal & Johnston
B. F. Mitchell

WASHINGTON
Doyle & Merriam
John Graham
William Mallis
F. A. Naramore
Whitehouse & Price
Wohleb & Stanley

WISCONSIN
A. W. Eschweiler
Foeller, Schober & Stephenson
Kirchoff & Rose
Scott & Mayer
F. J. Stepnoski
Van Ryn & DeGelleke

CANADA
F. Neil Brodie
S. S. Kennedy
Col. J. N. Senmens
Stevens & Lee
W. H.Wardwell

A Geographical Selection of Duriron Installations of Drain Pipe and Fans

ALABAMA

Alabama Polytechnic Inst., Auburn
High School, Tuscaloosa
Phillips High School, Birmingham
Age-Herald, Birmingham
Southern Cotton Oil Company, Montgomery
State Fertilizer Laboratory, Auburn

CALIFORNIA

Fremont High School, Los Angeles
Gonzales High School, Salinas
High School, Burbank
High School, Calipatria
High School, Corona
High School, Downey
High School, Esparto
Kern County High School, Bakersfield
Mt. Diablo High School, Concord
Polytechnic High School, Santa Ana
Pomona College, Claremont
Roosevelt High School, San Diego
State School for Girls, Ventura
State Teachers College, San Diego
Tulare County High School, Tulare
Union High School, Oakdale
Union High School, Tustin
University High School, Oakland
University of California, Berkeley
Venice High School
Alameda Co. Public Health Center
Hollywood Hospital, Hollywood
San Jose Hospital, San Jose
Seaside Sanitarium, Long Beach
American Electrotype & Eng. Co.
American Engraving & Colorplate Co.
Bryan Brandenburg Company, Los Angeles
B. W. Burridge Company, San Francisco
Chronicle, San Francisco
Fitzhugh Building, San Francisco
Ford Motor Co., San Francisco
Jewelers' Exchange Building, Los Angeles
Los Angeles Examiner
Los Angeles Rubber Stamp Company
Mutual Dairy Building, Los Angeles
Neuner Corporation, Los Angeles
San Francisco Daily News
San Jose Engraving Company
State Testing Laboratory, Sacramento
Standard Oil Building, San Francisco.

CONNECTICUT

American Hardware Corp., New Britain
Chase Metal Works, Waterbury
Eastern Malleable Iron Co., Union City
Naugatuck Chemical Co., Naugatuck
High School, Bristol
S. L. & G. H. Rogers, Hartford
Waterbury Mfg. Co., Waterbury
Yale University, New Haven

COLORADO

The Post, Denver
South Junior High School, Colorado Springs
West Junior High School, Colorado Springs
United States Mint, Denver

DISTRICT OF COLUMBIA

Eastern High School, Washington
Evening Star, Washington
National Engraving Co., Washington
Standard Engraving Co., Washington
U. S. Appraisers Stores
U. S. Department of Agriculture

FLORIDA

High School, Orlando
Ford Motor Co., Jacksonville
Times Union, Jacksonville

GEORGIA

Agnes Scott College, Decatur
American Bakeries Corp., Atlanta
Boys' High School, Atlanta
Buckeye Cotton Oil Co., Atlanta
Consolidated School, Montezuma
Constitution, Atlanta
Georgia School of Technology, Atlanta
High School, Brunswick
Law & Co., Cordele
Shuey & Co., Savannah
Southern Cotton Oil Co., Savannah
State Fertilizer Laboratory, Atlanta
Swift Fertilizer Works, Atlanta

IDAHO

High School, Bonner's Ferry
High School, Sand Point

ILLINOIS

Advance Engraving Co., Chicago
Beck Engraving Co., Chicago
Butler Brothers, Chicago
Chicago Band Instrument Co., Chicago
Commonwealth Edison Co., Chicago
Continental Can Co., Chicago
Federal Engraving Co., Chicago
Hibbard School, Chicago
Illinois Steel Co., Chicago
International Harvester Co., Chicago
High School, Maywood
High School, LaGrange
Michael Reese Hospital, Chicago
National Lock Co., Rockford
Postal Engraving Co., Chicago
Rand-McNally Co., Chicago
Rosary College, River Forest
Rockford Junior High School, Rockford
St. Mary's Seminary, Area
Straus Building, Chicago
Tilden High School, Chicago
Tribune Building, Chicago
Union Electric Co., East St. Louis
Western Electric Co., Chicago

INDIANA

Daily Times, Indianapolis
Fire Alarm Building, Terre Haute
General Electric Co., Ft. Wayne
Lehman Engraving Co., South Bend
Martinsville High School
Newport High School
Purdue University, Lafayette
Rose Polytechnic Inst., Terre Haute

IOWA

High School, Bloomfield
High School, Chariton
High School, Clarinda
High School, Corydon
High School, Ft. Madison
Lake City School, Des Moines
Lincoln High School, Des Moines
Roosevelt High School, Des Moines
State Center High School
Willard Battery Station, Ft. Dodge

KANSAS
High School, Wichita

KENTUCKY
DuPont M. T. High School, Louisville
Wadsworth Watch Case Co., Dayton

LOUISIANA
Cahn Building, Shreveport
Invincible Oil Co., Shreveport
Louisiana College, Pineville
Standard Oil Co., Baton Rouge
State University, Baton Rouge
Times-Picayune, New Orleans

MAINE
Deering High School, Portland
High School, Millinocket
Eastern Mfg. Co., South Brewer
Press-Herald, Portland

MARYLAND
Baltimore & Ohio R. R., Baltimore
Baltimore-Maryland Engraving Co.
Coca Cola Building, Baltimore
Forest Park High School, Baltimore
News, Baltimore
U. S. Appraiser's Stores, Baltimore
U. S. Department of Agriculture, Beltsville
Western Electric Co., Baltimore

MASSACHUSETTS
Boston College, Newton
Carnegie Institute, Brookline
Clark University, Worcester
Edison Electric Co., Boston
General Electric Co., Boston
General Electric Co., Pittsfield
Gillette Safety Razor Co., Boston
High School, Everett
High School, Greenfield
High School, Needham
Massachusetts Inst. of Tech., Cambridge
Palmer High School, Springfield
Parochial School, Newton
Republican, Springfield
Wentworth Institute, Boston
Western Electric Co., Boston

MICHIGAN
Cadillac Motor Car Co., Detroit
Detroit News, Detroit
Dodge Brothers, Detroit
Fisher Body Co., Detroit
Ford Motor Co., Detroit
Johns-Manville Co., Detroit
High School, Evart
High School, Flint
High School, Grand Rapids
Sacred Heart Seminary, Detroit
St. Joseph Sanitarium, Ann Arbor
University of Detroit

MINNESOTA
Duluth Engraving Co., Duluth
High School, Chisholm
High School, Coleraine
High School, Grand Rapids
High School, Hibbing
Mazda Lamp Works, Minneapolis
McDougal Creamery, Duluth
International Milling Co., Minneapolis
Normal School, Mankato
Naeve Hospital, Albert Lea
Pillsbury Flour Mills, Minneapolis
University of Minnesota, Minneapolis

MISSOURI
Acme Engraving Co., St. Louis
Central High School, Kansas City
Electric Storage Battery Co., Kansas City
Fisher Body Co., St. Louis
Ford Motor Co., St. Louis
Globe Democrat, St. Louis
Koken Barber Supply Co., St. Louis
Post-Dispatch, St. Louis
St. Francis Xavier College, St. Louis
St. Louis University H. S., St. Louis
South Side High School, St. Louis
Sisters Hospital, St. Joseph
University of Missouri, Columbia
U. S. Food & Drug Laboratory, St. Louis

NEBRASKA
High School, Fairbury
High School, Fremont
High School, Newell
High School, Scribner
North High School, Omaha
St. Mary's Hospital, Columbus
State Capitol Building, Lincoln
Whittier School, Lincoln

NEW JERSEY
Agricultural College, New Brunswick
Greenville Junior H. S., Jersey City
Lincoln High School, Jersey City
High School, Atlantic City
High School, Bogota
High School, Lakewood
Lehn & Fink, Bloomfield
Michelin Tire Co., Milltown
Prudential Insurance Co., Newark
Singer Mfg. Co., Elizabeth
Summit High School
Sunday Call, Newark
Westinghouse Lamp Works, Bloomfield

NEW YORK
American Can Co., Brooklyn
Beth Israel Hospital, New York
Consolidated Laboratories, Astoria
Binghamton Press, Binghamton
Buffalo News, Buffalo
Biltmore Hotel, New York
East High School, Rochester
Columbia University, New York
Fisher Body Co., Buffalo
Gorton High School, Yonkers
Hospital for Joint Diseases, New York
Hudson Towers Hospital, New York
High School, Bath
High School, Fulton
Fifth Avenue Hospital, New York
Fordham University, New York
High School, Geneva
High School, Irondequoit
High School, Lyons
Loose-Wiles Biscuit Co., Long Island City
N. Y. Edison Co., New York
New York Tribune, New York
New York World, New York
New York University, New York
Northeast Electric Co., Rochester
Pictorial Review, New York
Mt. Sinai Hospital, New York
Pratt Institute, Brooklyn
State Normal School, Potsdam
Vincentian Institute, Albany
St. Joseph's Hospital, Elmira
St. Mary's Hospital, New York

NORTH CAROLINA
Central High School, Charlotte
High School, Concord
High School, Gastonia

NORTH CAROLINA—*Continued*

High School, Laurinsburg
High School, Marion
Jefferson Std. L. I. Building, Greensboro
Law & Co., Wilmington
Southern Cotton Oil Co., Goldsboro
State Department of Agriculture, Raleigh
Swift Fertilizer Works, Wilmington

OHIO

Advertisers Building, Dayton
American Rolling Mills, Middletown
Anes Laboratory, Fremont
Audubon High School, Cleveland
Bexley School, Columbus
Citizen Publishing Co., Columbus
Daily News, Canton
Daily News, Dayton
Delco, Dayton
East High School, Cleveland
Grover Cleveland High School, Zanesville
High School, Bedford
High School, Dresden
Lake Shore High School, Euclid
Lammers Company, Dayton
Home Steam Laundry, Cincinnati
Lake Erie Glass Co., Cleveland
National Lamp Works, Cleveland
Ohio State University, Columbus
Private Hospital, Portsmouth
Rayen High School, Youngstown
Roosevelt High School, Dayton
Safe Cabinet Co., Marietta
South High School, Columbus
West Tech. High School, Cleveland
White Motor Co., Cleveland

OKLAHOMA

Cochrane Laboratory, Picher
Daily Oklahoman, Oklahoma City
Marland Refining Co., Ponca City

OREGON

Grant High School, Portland
Fuller Building, Portland
High School, Helix
Oregon Engraving Co., Portland
Oregon Journal, Portland
State Agricultural College, Corvallis
Reed College, Portland
Washington High School, Portland

PENNSYLVANIA

Allentown Call, Allentown
Bureau of Surveys, Philadelphia
Carnegie Institute, Pittsburgh
Copper Clad Steel Co., Braddock
Hospital, Bryn Mawr
Penn Engraving Co., Scranton
Pennsylvania R. R., Altoona
Pittsburgh Plate Glass Co., Pittsburgh
Presbyterian Hospital, Philadelphia
Roxboro High School, Philadelphia
Reading General Hospital, Reading
Sacred Heart Hospital, Allentown
United States Mint, Philadelphia
West Penn Hospital, Pittsburgh
Westinghouse High School, Pittsburgh

RHODE ISLAND

Pawtucket High School
Providence Journal, Providence

SOUTH CAROLINA

Clemson College, Clemson
Southern Cotton Oil Co., Columbia
High School, Rock Hill
Technical High School, Charleston
Union Bleaching & Fin. Co., Greenville

SOUTH DAKOTA

High School, Rapid City
High School, Spearfish

TENNESSEE

Buckeye Cotton Oil Co., Memphis
Crockett High School, Memphis
Commercial Appeal, Memphis
Consolidated School, Rogersville
Dow & Griscom, Chattanooga
High School, Morristown
High School, Pleasant Hill
State Memorial Building, Nashville

TEXAS

Capitol Engraving Co., Austin
High School, Nederland
Parkland Hospital, Dallas
South Park High School, Beaumont
Southwestern Engraving Co., Ft. Worth

VIRGINIA

Atlantic Life Insurance Co., Richmond
Princess Anne High School, Norfolk
State Office Building, Richmond
U. S. P. H. S. Hospital, Norfolk

WASHINGTON

Capital National Bank Building, Seattle
Garfield High School, Seattle
Kennecott Copper Co., Tacoma
Lewis & Clark High School, Spokane
High School, Kirkland
Pacific Coast Steel Co., Seattle
Providence Hospital, Everett
Reed High School, Shelton
St. Vincent Hospital, Seattle
Seattle Times, Seattle
Tenino High School, Tenino

WEST VIRGINIA

Douglas Junior High School, Huntington
Colored Institute, Institute
Libbey-Owens Glass Co., Charleston
The Advertiser, Huntington
University of West Virginia, Morgantown

WISCONSIN

Belle City Iron Works, Racine
Children's Hospital, Milwaukee
Continuation School, Milwaukee
High School, DePere
High School, Janesville
High School, Oshkosh
International Harvester Co., Milwaukee
Kurth Engraving Co., Milwaukee
Marquette University, Milwaukee
Milwaukee Electric Light Company
Milwaukee Gas Spec. Co., Milwaukee
Newport Company, Carrollville
Photo Engraving Co., Milwaukee
Pittsburgh Plate Glass Co., Milwaukee

CANADA

Caron Brothers, Montreal
Collegiate Institute, Saskatoon
LaPresse Publishing Co., Montreal
Martell Stewart Co., Montreal
Rehauer Engraving Co., Toronto
Robin Hood Mills, Ltd., Calgary
University of New Brunswick, Fredericton

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INTERNATIONAL

CCA